MINUTES OF THE MEETING
SENATE NATURAL RESOURCES COMMITTEE
MONTANA STATE SENATE
March 22, 1985

The twenty-fourth meeting of the Senate Natural Resources Committee was called to order by Chairman Dorothy Eck at 12:30 p.m., March 22, 1985, Room 405, State Capitol Building.

ROLL CALL: All members of the Senate Natural Resources Committee were present with the exception of Senator Daniels.

CONSIDERATION OF HB638: Representative Iverson, sponsor of HB638, stated this bill is one of a series of three bills and deals with the small miner's exemption under the Hard-Rock Mining Act. Representative Iverson is introducing HB638 because he feels the exemption allowed for small miners is being abused. In addition to limiting small mines that may be accumulated by persons or corporations, HB638 provides for a civil action against persons abusing the exemption. Representative Iverson also noted the language "or exploration" on page 5, line 7, is deleted.

PROPONENTS: Mr. George Ochenski, representing the Environmental Information Center, stated HB638 is an example of the cooperation between the environmentalists and industry. Mr. Ochenski is a proponent of HB638.

Mr. John North, representing the Department of State Lands, submitted written testimony from Mr. Dennis Hemmer, Commissioner of the Department of State Lands (Exhibit 1) in favor of HB638.

Ms. Jeanne-Marie Souvigney, representing the Northern Plains Resource Council, asked to go on record as a proponent of HB638.

Written testimony was also submitted by Mr. Thomas E. Schessler (Exhibit 2) and Mr. Don C. Cowles (Exhibit 3) in favor of HB638.

There being no further proponents, no opponents and no questions from the committee, the hearing on HB638 was closed.

CONSIDERATION OF HB711: Representative Cohen, sponsor of HB711, stated the purpose of HB711 is to give local governments an opportunity to preserve the Flathead Basin. The excess amount of phosphates in Flathead Lake has caused a buildup of algae and rapid ageing of Flathead Lake. Representative Cohen stated he is not asking the committee to determine whether a ban on the use of detergents containg phosphates will be effective in limiting the amount of algae, but rather whether local governments should have the power to enforce such a ban if they feel it

is necessary. Representative Cohen submitted written testimony (Exhibit 4), and a list of the phosphorus content of the various commercial detergents (Exhibit 5). Written testimony was also submitted from Claire Strickler, President of the Whitefish City-County Planning Board (Exhibit 6); Ms. Jo Messex, Manager of Whitefish County Water and Sewer District (Exhibit 7); Ms. Virginia Burns-Sloan (Exhibit 8); and Randy Pau (Exhibit 9); and, Mr. W. R. Tincher, President of Purex Industries, Inc., (Exhibit 10). A copy of a Resolution adopted by the Montana Home Economics Association concerning water quality was also submitted (Exhibit 11), along with a newspaper article addressing HB711 (Exhibit 12), an advertisement for Liquid Tide (Exhibit 13) and a detailed summary of what phosphorus is and what products contain phosphorus (Exhibit 14). Representative Cohen also submitted proposed amendments (Exhibit 15).

Mr. Jack Stanford, Director of Flathead Lake Biological Station, submitted written testimony (Exhibit 16) in favor of HB711.

Mr. Paul J. Horvatin, from the United States Environmental Protection Agency, submitted written testimony (Exhibit 17) concerning the effect of legislation limiting the phosphorus content of detergents in the Great Lakes Basin (Exhibit 18).

Mr. John Wilson, Administrator of the Montana Promotion Division, Department of Commerce, submitted written testimony (Exhibit 19) in favor of HB711.

Mr. Don Schiemann, Montana State University, submitted a statement on the bactericidal benefits of phosphates in detergents (Exhibit 20). Mr. Schiemann is a proponent of HB711.

Mr. Mike Hutchin, Chairman of the Lake County Commissioners, submitted written testimony (Exhibit 21) in favor of HB711, and an article regarding the phophorus ban from the Daily Interlake, dated March 19, 1985 (Exhibit 22).

Mr. Dick Wollin, representing the Polson Chamber of Commerce, stated time is running out for Flathead County. Mr. Wollin believes this issue is important and the public's awareness should be raised. This issue, he stated, affects the quality of life for many people in the Flathead Valley.

Mr. Steve Pilcher, Chief of the Water Quality Bureau, Department of Health and Environmental Sciences, submitted written testimony (Exhibit 23) in favor of HB711.

Mr. Chris Hunter, Consulting Limnologist, submitted written testimony (Exhibit 24) in favor of HB711.

Mr. Brace Hayden, Executive Director of the Flathead Basin Commission, submitted written testimony (Exhibit 25) in favor of HB711.

Mr. George Ochenski, representing the Environmental Information Center, is a proponent of HB711.

Mr. Jim Flynn, Department of Fish, Wildlife and Parks, submitted written testimony (Exhibit 26) in favor of HB711.

Mr. Don Allen, representing the Montana Hospital Association, is a proponent of HB711.

Ms. Mary Wright, representing Trout Unlimited, submitted written testimony (Exhibit 27) in favor of HB711.

Ms. Ann Humphrey, representing the Montana Audubon Council, submitted written testimony (Exhibit 28) in favor of HB711.

Mr. Robert C. McKenna, President of the Canyon Ferry Recreation Association, submitted written testimony (Exhibit 29) in favor of HB711.

Ms. Carol Eisenstien, an interested citizen, testified in favor of HB711.

There being no further proponents, the hearing was opened to opponents.

OPPONENTS: Mr. Jerome Anderson, representing the soap and detergent industry, stated the industry wants to be part of the solution, not part of the problem. Mr. Anderson feels the problem in Montana is entirely different than the problems experienced by the people in the Great Lakes region. Mr. Anderson urged the committee to consider the effects passage of HB711 will have on the local industry. Mr. Anderson submitted written testimony (Exhibit 30). Mr. Anderson also submitted written testimony from E. F. Barth (Exhibit 31) and a resume from Mr. Barth (Exhibit 32). Mr. Anderson also submitted a report submitted to the Soap and Detergent Association by RSE, Engineers, regarding the removal of phosphates in the upper Flathead River Basin (Exhibit 33).

Mr. Mark Lorenzen, representing the Soap and Detergent Association, submitted written testimony (Exhibit 34) in opposition to HB711.

Mr. A. G. Payne, representing the Proctor and Gamble Company, submitted written testimony (Exhibit 35) in opposition to HB711.

Mr. Jim Hodge, owner of Columbia Chemical Company and a seasonal resident of Flathead Lake, realizes there is a problem with the phosphorus in Flathead Lake, but he believes there is a more reasonable solution to the problem. Mr. Hodge stated his company will be required to do a substantial amount of reformulation if HB711 is passed. Mr. Hodge believes the problem of phosphorus in Flathead Lake is caused by sewage treatment systems rather than detergents. Mr. Hodge testified HB711 will cause his company severe loss.

Mr. Peter Petch III, representing Associated Food Stores, submitted written testimony (Exhibit 36) in opposition to HB711.

Mr. Frank Capps, Montana Director of the Food Distributors Association, feels his association should not be told to clean up the water at Flathead Lake. The residents of Flathead Lake have done the damage; therefore, the responsibility should lie with them. Mr. Capps feels the law would be inadequate because it prohibits the sale of detergents containing phosphates, but does not prohibit the use of these detergents. Mr. Capps feels HB711 is bad legislation.

Mr. Tom Joehler, chemist for Columbia Chemical, submitted written testimony (Exhibit 37) in opposition to HB711.

Mr. Charles Gravely, representing the Montana Food Distributors Association, testified the ban on phosphorus would be impossible to enforce. Mr. Gravely submitted a newspaper article from The Missoulian, dated March 19, 1985 (Exhibit 38).

J. Fallon, representing the Montana Chamber of Commerce, submitted a newspaper article from The Wall Street Journal (Exhibit 39) indicating the ban on phosphates will force people to bring in detergents from other counties.

Mr. Chad Smith submitted written testimony from Dr. Edwin A. Matzner, Monsanto Company (Exhibit 40) regarding Montana's proposed legislation. A memorandum to Steven L. Pilcher from the Department of Health and Environmental Sciences regarding the Flathead River Basin Project Status was also submitted (Exhibit 41).

Mr. Glen Mitchell, representing the Montana Textile Association, is opposed to HB711.

Mr. George Allen, representing the Montana Retail Association, is opposed to HB711.

There being no further opponents, the hearing was opened to questions from the committee.

Senator Shaw stated he was required to stop using phosphate detergents because of the "fillers" contained in these detergents damaging his septic system.

Senator Mohar questioned whether the three percent reduction in phosphates in Flathead Lake would actually make a difference. Mr. Stanford stated he is glad everyone recognizes there is a problem on Flathead Lake. Mr. Stanford believes Flathead Lake is at a threshold and the action taken on HB711 will make the difference concerning which way the lake goes. Mr. Stanford believes the three percent change will be significant. Mr. Lorenzen stated he would like to see the evidence to support Mr. Stanford's theory.

Representative Cohen closed the hearing on HB711 by stating the intent of the bill is to reduce the level of phosphates in Flathead Lake. Representative Cohen believes the ban on detergents will result in a 20 percent reduction of phosphates in Flathead Lake.

There being no further questions from the committee, the hearing on HB711 was closed.

CONSIDERATION OF HJR20: Representative Schultz, sponsor of HJR20, stated the Soil Conservation Service has been doing worthwhile projects in Montana for 50 years. Representative Schultz feels the Soil Conservation Service should be recognized for its service to Montana.

PROPONENTS: Mr. Ray Beck, representing the Department of Natural Resources and Conservation, submitted written testimony (Exhibit 42) in favor of HJR20.

Mr. Dave Donaldson, Executive Vice President of the Montana Association of Conservation Districts, submitted written testimony (Exhibit 43) in favor of HJR20.

Mr. Allen Eck, representing the Montana Farm Bureau Federation, submitted written testimony (Exhibit 44) in favor of HJR20.

There being no further proponents, no opponents and no questions from the committee, the hearing on HJR20 was closed.

ACTION ON HJR20: Senator Shaw moved HJR20 BE CONCURRED IN. The motion carried.

CONSIDERATION OF HJR25: Representative Swift, sponsor of HJR25, explained HJR25 will request the Montana Congressional

Delegation to submit a wilderness bill asking Congress to allocate federal land in Montana. Representative Swift stated there are 16.7 million acres of wilderness land in Montana. Representative Swift feels HJR25 will place pressure on the federal government to designate the amount of wilderness land which will remain wilderness and how much will be opened up for other uses.

PROPONENTS: Ms. Susan Cottingham, representing the Montana Chapter of the Sierra Club, feels HJR25 will urge the delegation to come to terms in regard to wilderness areas. Ms. Cottingham feels the wilderness areas are not stopping development in Montana, since over 600,000 acres of wilderness areas have been developed in Montana since the 1979 RARE report was issued.

Ms. Janet Ellison, representing the Montana Audubon Council, is hopeful the situation will be resolved within the next two years. Ms. Ellison is a proponent of HJR25.

Mr. Don Allen, representing the Montana Wood Products Association, supports the resolution with the amendments from the House of Representatives. Mr. Allen feels this issue needs to be resolved.

Mr. Mike Micone, representing the Western Environmental Trade Association, supports HJR25 but has problems with the amendments. Mr. Micone feels action should be taken immediately to resolve this issue.

Mr. Alan Eck, representing the Montana Farm Bureau Federation, supports HJR25. Mr. Eck submitted written testimony (Exhibit 45) in favor of HJR25.

Mr. Jim Richard, representing the Montana Wildlife Federation, supports HJR25.

There being no further proponents, no opponents and no questions from the committee, the hearing on HJR25 was closed.

CONSIDERATION OF HJR27: Representative Nisbet, sponsor of HJR27, stated this bill simply honors the appearance of Halley's Comet and urges people to dim their lights so the comet can be seen more easily.

PROPONENTS: Ms. Janet Ellis, an interested citizen, submitted a graph depicting the observance conditions for Halley's Comet (Exhibit 46).

Ms. Jill Rohyans, Vice President of the Helena Astronomical Society, submitted written testimony (Exhibit 47) in favor of HJR27.

Ms. Dorothy Starshine, an interested citizen, stated air pollution and artificial light are destroying the view of the stars. Ms. Starshine supports HJR27.

Ms. Betsy Spettigue, representing Dr. Gerald Wheeler, supports HJR27. Ms. Spettigue submitted written testimony from herself (Exhibit 48) and Dr. Wheeler (Exhibit 49).

Mr. Mark Dinsmore, an interested citizen, stated artifical light will make it difficult for those wishing to photograph the comet. Mr. Dinsmore stated any help the committee could give the public would be appreciated.

Written testimony was also submitted by Georgeanne R. Caughlan, Professor Emeritus at Montana State University, in favor of HJR27 (Exhibit 50).

There being no further proponents, no opponents and no questions from the committee, Representative Nisbet closed by stating the comet will be visible for the first time in November, although the tail will not be as long.

CONSIDERATION OF HJR35: Representative Dave Brown, sponsor of HJR35, stated HJR35 will encourage the development of magneo-hydrodynamics, a technology which gives cleaner coal-fired generating plants without using much water. By passing HJR35, the legislature will be supporting this advanced technology, and the federal programs designed to support this technology. Representative Brown submitted an outline depicting the objectives of the proposed MHD program (Exhibit 51).

PROPONENTS: Mr. Jack Sherick, representing MSE and manager of the facility in Butte, Montana, stated the coal-fired MHD plant in Butte will be the largest in the world.

There being no further proponents, no opponents and no questions from the committee, the hearing on HJR35 was closed.

CONSIDERATION OF HJR10: Representative Bachini, sponsor of HJR10, stated this resolution is overdue and recognizes the Sons and Daughters of the Pioneers for their donation of the land on which the Mitchell Building was built. HJR10 will provide a tablet in the Mitchell Building recognizing the contribution.

PROPONENTS: Mr. Bruce Lobel, representing the Sons and Daughters of the Pioneer, is in favor of HJR10.

Ms. Ellen Feaver, representing the Department of Administration, asked to be recognized as a proponent of HJR10.

There being no further proponents, no opponents and no questions from the committee, the hearing on HJR10 was closed.

ACTION ON HJR10: Senator Mohar moved HJR10 BE CONCURRED IN. The motion carried.

There being no further business to come before the committee, the meeting was adjourned.

Dorothy Eck

Senator Dorothy Eck, Chairman

ROLL CALL

Natural Resources COMMITTEE

48th LEGISLATIVE SESSION -- 1985 Date 032285

SENATE SEAT #

NAME	PRESENT	ABSENT	EXCUSED
ECK, Dorothy (Chairman	✓		
HALLIGAN, Mike (Vice Chairman)	✓		
WHEELING, Cecil	✓		
MOHAR, John	✓		
DANIELS, M. K.			
FULLER, David	✓		
CHRISTIAENS, Chris	✓		
TVEIT, Larry	✓		
GAGE, Delwyn	✓		
ANDERSON, John	✓		
SHAW, James	✓		
HARDING, Ethel	✓		

Each day attach to minutes.

DATE 032285

COMMITTEE ON 711

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One: Support	Check One: Oppose
John Wilson	Dept of Commerce	711	✓	
Ute Stevens	Retail Grocers	711		✓
Peter Catelli III	wholesale Grocers	HB 711		✓
Ray Ormesher	Supply Market	711		✓
Ken Cryderman	" " "	711		✓
Kris Tuttle	" "	711		✓
Susan Cottingham	Sierra Club - Mt Chpt	711	✓	
D. Morris	MACo - Flathead Co.	711	✓	
Joanne Sowards	NPRC	638	✓	
Bill Burnett	Columbia Chemical	711		✓
Alan Erk	MT Farm Bureau	HJR 20 HJR 25	✓	
Don Allen	MT Hospital Assoc.	711	✓	
Roland D Pratt	MT Restaurant Assoc	711		X
Gary Allen	MT Retail Assn	711		X
Carol Eisenstein	Self	711	✓	
Stuart Doggett	MT. Stockgrowers Ass	HJR25	✓	
Bill Volkmer	Canyon Ferry Rec. Assoc	711	✓	
Bree Anstrom	" " "	711	✓	
Linda Stoll Anderson	MACounty Commissioners	HB 711	✓	
Jim Schultz	Dist 30 Rep	HJR 20	✓	
Ray Beck	COOPERS	HJR 20	✓	
Dave Donaldson	MT. Assoc. of Cons Dist	HJR 20	✓	
Esther Rand	MT. Cattlemens Assn	HJR 25	✓	
Don Heinz	MT. Wildlife Fed	711	✓	

(Please leave prepared statement with Secretary)

DATE 032285

COMMITTEE ON HB 711

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One: Support	Check One: Oppose
Larry Peddicord	Procter & Gamble	HB 711	~~✓~~	✓
Dave White	Coop. Extension Serv/MSU	HB 711	Neither	Neither
Mary L. Bart	SDA	HB 711		✓
AG Payne	Procter & Gamble	HB 711		✓
Ed. Ochenski	ENV. INF. CENTER	HB 711	~~X~~	
Steve Pilcher	OHES	HB 711	✓	
J Fallan	MT Coal C			X
D A Schiemann	Mont State Univ	HB 711	✓	
Marc Lorenzen	SDA	"		✓
Glenn Mitchell	Mont. Textile Assn	"		✓
Joe Togal	Msla Text. Le Services	HB 711		✓
Chris Hunter	Self	HB 711	X	
Ed Barth	Barth Tec, Inc	" "	Neither	Neither
Richard Sedlak	SDA	HB 711		✓
Paul Horvatin	USEPA	HB 711	✓	
Ann Humphreys	MT. Audubon Council	HB 711 HJR 25	X X	
Dick Wells	Polson Chamber of Commerce	HB 711	✓	
Jack A. Stanford	Bigfork	HB 711	✓	
Dee Reinegardner	MT Health Care Assn	HB 711	No Position	
Mike Putnam	Lake County	HB 711	X	
Frank Cooper	Montana Food Wash Assn	HB 711		X
Jessy Sorensen	Lake County	HB 711	✓	
Ellen Feaver	Dept of Admin	HJR 10	✓	
Hal Price	Mont Wildlife Fed.	HB 711	✓	
Gary Amestoy	Dept of State Lands	HB 638	✓	
Bruce Hayden	Gov Office / Flathead Resources	HB 711	✓	

(Please leave prepared statement with Secretary)

DATE 032285

COMMITTEE ON HJ-27

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One	
			Support	Oppos
Starshine	Students of area	✓	✓	
M. DINSMORE	Helena Astro. Soc.	✓	✓	
Janet Ellis	Helena	✓	✓	
Betsy Spethigue	Helena		✓	

(Please leave prepared statement with Secretary.)

DATE 3-22-85

COMMITTEE ON HJR 25

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One	
			Support	Oppose
Mike Micone	WETA	HJR25	X	
Don Gillespie	MT. Wood Products Assn	HJR25	✓	
Susan Cottingham	Mt Chpt Sierra Club	HJR25	✓	

(Please leave prepared statement with Secretary)

DATE 032285

COMMITTEE ON HJR-35

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One	
			Support	Oppos
Bill Bermingham	MTM States Energy	HJR-35	✓	
Jack Sherick	MSE	HJR-35	✓	
Mike Sherick	Self	HJR-35	✓	
Jane Brown	Sponsor. Butte Dist #72	HJR-35	✓	

(Please leave prepared statement with Secretary)

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.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 1
DATE 032285
BILL NO. HB638

Thomas E. Schessler
7010 Bristol Lane
Bozeman, MT 59715
13 February, 1985

Honorable Peter R. Story
Senate of the State of Montana
Helena, MT 59620

Dear Senator Story:

I am replying, although not very adequately, to your February 6 request for comments on House Bills 637 and 638. As a Montana native who has only recently returned after many years' absence, I fear I haven't yet sufficient background in the State's mining laws. I am highly interested, and will correct that deficiency in short order, I hope. My primary experience has been at the level of Federal mining legislation and regulation.

HB 638. Pp. 7&8, the underlined portions.

Q - Is the bill, or the Act to which it is related, meant to help control and regulate small mine operations, or is it meant to penalize and stultify the initiative of "small" individuals and concerns? It seems to me that that aspect should be looked at very closely.

I've no quarrel with the proposed revision of 82-4-361. It does seem to me, however(and here is where I lack background in the basic legislation), wilful violations, after proper notice from the appropriate agency that something has gone haywire, should be the criterion for fines and other sanctions. This is probably properly taken care of somewhere in the statutes since I have no problems with the proposed language of HB 637 or with the wording of the penalty provisions as they now exist in 82-4-362, (2).

Incidentally, by your place of residence, are you by chance related to Mr. Malcolm Story? I met him only twice, and we talked at some length both times. A very fine man, whom I admire. He and my father-in-law knew one another.

Sincerely,

Thomas E. Schessler

SENATE NATURAL RESOURCES COMMITTE
EXHIBIT NO. 2
DATE 032285
BILL NO. HB638

Oceanside Ca.
26.11.85

Dear Pete -

Your letter regarding House Bill 637 & 638 has been forwarded to me and sorry for the delay in answering.

As our State motto "Oro y Plata" attests, Gold & Silver and later other metals were extremely important in the development of Montana.

Although many people and particularly environmentalists ignore this, nevertheless the future of Montana economically is tied to our natural resources; Ranching, Farming, Mining, & Timber.

The small miner is essential. He is generally a prospector who pokes a few holes but never makes any thing. Later, these same

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 3
DATE 032285
BILL NO. HB638

2. Mineral is where you find it and very few places on this earth have been blessed with the unlimited, unexplored and undeveloped abundance of this great variety of minerals we have in Montana.

The small miner has been discouraged from prospecting in many ways, Wilderness designation, Forest Service regulations, and other legal and filing regulations. These bills are just another notch in an already too tight belt.

What little damage or unsightly disturbance he may cause is greatly outweighed by the benefits he is likely to create for all of us.

(over)

And reason for a large company to develop interest.

I have been very familiar with the head water country of the main Boulder River in Park & Sweetgrass Counties for over 60 years. I know of 100's of prospect holes, mostly out of sight in the timber or high on the rocks on the side of a mountain, or in locations where people never go. They cause no environmental damage and only the extreme ecologist would complain of them.

They, however, serve the valuable purpose of structure on the future lead the way to a large economic development for Montana and of strategic importance to the welfare of the United States.

I do appreciate your writing me very much. Thank you.

Sincerely

Dan C. Cortes

HB 711

LOCAL REGULATION OF PHOSPHORUS DETERGENT USE

What does HB 711 Do?

HB 711 allows county governments to protect local water quality by prohibiting the sale and distribution of phosphorus containing detergents. HB 711 is a local option bill and would only be applicable in those counties choosing to adopt a model phosphorus cleaning compound rule.

Why is HB 711 Needed?

Large amounts of phosphorus are entering some lakes and rivers in Montana as a result of human activity. In these regions, this excess phosphorus is stimulating algae growth and decreasing water quality.

Phosphorus and Algae Growth

Phosphorus is a natural element. A little bit is essential for all life--but too much phosphorus can cause trouble. Excess phosphorus stimulates algae growth and speeds up the deterioration (aging) of lakes.

At Flathead Lake, in recent years, more algae has been noticeable on shoreline rocks, boat docks, and the bottom of boats. For the first time toxic algae blooms were documented in 1983 and 1984.

As algae increases, oxygen in the water decreases and, over time, the water becomes too murky and vegetation clogged for recreation. Native trout fisheries will gradually disappear to be replaced by suckers and other rough fish.

What are the Solutions?

Two ways we can reduce the amount of phosphorus entering our lakes and rivers are:

-Go to the source and reduce the use of phosphorus compounds.

-Remove phosphorus at Sewage Treatment Plants.

Ten years of studies at the University of Montana's YellowBayBiological Station indicates that at least 10% of the biologically available phosphorus entering Flathead Lake comes from phosphorus detergents. This percentage, while small, is extremely significant because Flathead and other western lakes are now on the "threshold" between health and deterioration. Even as little as a one-half percent decrease in phosphorus detergent inputs may be enough to prevent toxic algae growth in coming years.

Restricting the use of phosphorus detergents, will:

-Act to reduce biologically available phosphorus levels now and help prevent further water quality deterioration.

-Contribute to a long-term solution for small lakes surrounded by houses with spetic tanks.

-Lower operating costs of sewage treatment plants (STP) by reducing the amount of phosphorus the STP's have to remove.

A Phosphorus Cleaning Compound Restriction is only Part of the Solution

Our State Health Department has adopted a strategy to limit phosphorus in Flathead Lake. One portion of this strategy is to require area sewage treatment plants to reduce the level of phosphorus in their discharges by installing an advanced form of water cleaning technology called tertiary treatment. This technology will not, however, remove all of the phosphorus in the sewage discharges. Nor will it remove any of the phosphorus in the sewage for the more than 50% of the Flathead area households not tied to a sewer system. Thus, another part of the strategy is to limit phosphorus detergent use.

And to Clarify some Common Misunderstandings about HB 711.....

Enforcement is on the shelf and not at the washer

HB 711 allows counties to ban the sale of phosphorus cleaners only. Citizen's using phosphorus detergents cannot be penalized.

Will a phosphorus ban burden retailers?

Retailers currently stock both phosphorus and phosphorus-free detergents. Retailers serving both ban and non-ban counties can easily stock their trucks at the warehouse to handle store orders. If a store in a ban county offers a phosphorus detergent for sale, the county must notify the store of its violation. If, after 30 days from notification, the store has not taken the product off its shelf, the store is subject to a misdemeanor penalty.

What about hospitals that need bacteria removed?

Tests at the MSU Microbiology Department have shown phosphorus detergents do not remove more bacteria than phosphorus-free detergents. Water temperature is the major factor responsible for killing bacteria.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 4
DATE 032285
HB711

Does this bill affect agriculture?
No! HB 711 allows counties to ban the sale of phosphorus cleaners only. It does not affect the phosphorus used in fertilizer.

We are told that 32 cows produce as much phosphorus as all the detergent in Flathead County. Is this correct?
No! This statement is based on each cow producing 285 grams of phosphorus per day- that's 10 ounces of pure phosphorus. Data from the MSU Animal and Range Science Department indicate that these cows would have to daily consume 625 pounds of alfalfa hay. In actuality, it would take about 2500 Montana cows dropping their wastes directly into Flathead Lake to produce as much phosphorus as these 32 super cows. Current regulations control the discharge of livestock waste from animal concentration areas.

WHY IS PHOSPHORUS USED IN DETERGENTS?
It is used to soften water. Phosphorus is one of several water softening agents available to detergent manufacturers.

ARE PHOSPHORUS FREE DETERGENTS COMMON?
Yes! A few of the common brands are White King, All, Purex, Dynamo, Woolite, and Sun. Many name brand detergents are also now being marketed in a non-phosphorus liquid form, including Liquid Tide, that has recently been introduced into western Montana.

DOES USING PHOSPHORUS - FREE DETERGENTS COST MORE THAN OTHER DETERGENTS?
Phosphorus detergents are competively priced with other brands. Some people, however, believe that phosphorus-free detergents cost more because people using these products will use additional hot water to clean their clothes. This is not necessarily so: phosphorus-free detergents have greatly improved in recent years and many people now prefer them to phosphorus detergents.

DO OTHER STATES RESTRICT PHOSPHORUS IN DETERGENTS?
Yes! Six states currently have phosphorus detergent limitations: Indiana, Michigan, Minnesota Wisconsin, Vermont and New York. In addition, local ordiances limit phosphorus detergents in Chicago, Miami, Akron (Ohio), 2 resort communities in Maine, and 5 resort communities in New Hampshire. All Canadian Provinces have phosphorus detergent limitations.

WHAT IS THE ECONOMIC IMPORTANCE OF HB 711 TO THE FLATHEAD AREA?
A recently completed study on the Flathead River Basin indicated that should Flathead Lake lose its pure, crystal clear quality, millions of dollars in tourist revenue will be lost annually.

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

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 5
DATE 032285

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

192 Larch Lane
Columbia Falls, MT 59912
March 9, 1985

Senator Dorothy Eck, Chairman
Senate Natural Resources Committee
Capitol Station
Helena, MT 59620

Dear Senator Eck:

I urge a favorable vote of your committee on HB 711 when you hear it on Monday, March 11. The bill would enable county commissioners to enact a limitation on the sale of high phosphate detergents and cleaning products.

Because the cities of Whitefish, Columbia Falls and Kalispell have been asked by the state Water Quality Bureau to achieve a phosphorus level of 1.0 mg. per liter of effluent from our treatment plants and because that level will be next to impossible to reach without this legislation, a "YES" vote is vital! Whitefish alone currently contributes 5.8 metric tons of phosphates per year to Flathead Lake. By the year 2000, that is expected to rise to 9.9 metric tons! That is a lot of fertilizer, and the growth of algae will respond proportionately!

Our Planning Board is now going to require developers along the Whitefish River who will be contributing possible additional large amounts of phosphates, such as golf courses, to have a phosphate management plan. We regret having to add requirements to their preliminary planning, but the alternative, to do nothing, is to invite crisis in the water quality in the Flathead Valley.

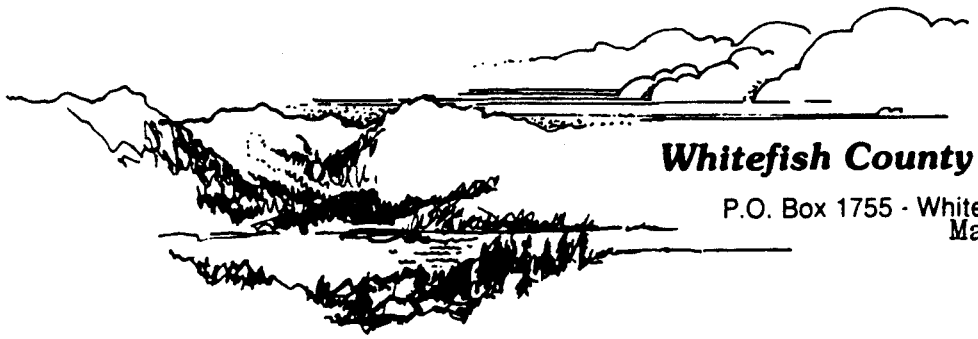
I hope you will help us in the effort to protect the Flathead Lake watershed! Thank you!

Sincerely,

Claire Strickler

Claire Strickler, President
Whitefish City-County Planning Board
(also Legislative Action Chair,
League of Women Voters of Flathead County)

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 6
DATE 032285
BILL NO. HB711



Whitefish County Water & Sewer District

P.O. Box 1755 - Whitefish, MT 59937 - 406-862-4139

March 8, 1985

Senator Dorothy Eck
Chairman, Natural Resources Committee
Capitol Station
Helena, MT 59620

Dear Senator Eck,

The Whitefish County Water and Sewer District was formed by a four to one vote of District residents in 1982 for the purpose of maintaining water quality in the Whitefish Lake watershed in northern Flathead County. This effort to maintain water quality was initiated by citizens concerned by obvious declines in water quality and committed to reducing negative impacts on water resources.

In June of this year, the District will adopt a Water Quality Management Plan to maintain and enhance the water resources in the 39,300 acres included in the District. The approach to maintaining water quality is varied and addresses both pollution sources and land disturbance which may adversely impact water quality. Reduction of phosphorus inputs is an instrumental part of maintaining water quality as phosphorus is a limiting factor in algea growth. Use of non-phosphorus detergents will significantly reduce phosphorus discharges from both sewer treatment plants and septic systems. This is a significant stride toward maintaining water quality in the Flathead Basin and Whitefish Watershed.

The Board of Directors of the District strongly urges your support of HB #711 to allow counties to ban the sale of phosphorus detergents. The Board believes this is a major step in controlling degradation of water resources which are essential to the economic future and quality of life of this region.

Sincerely,

Jo Messex

Jo Messex
Manager

for: Board of Directors, Whitefish County Water & Sewer District

cc: Rep. Ben Cohen
Brace Hayden

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 7
DATE 032285
HB711

Senator Dorothy Eck, Chairperson
Senate Natural Resources Committee
Capitol Station
Helena, Mt. 59620

Dear Senator Eck,

I am writing in support of House Bill 711 sponsored by Representative Ben Cohen enabling counties to ban detergents containing phosphorous.

In 1975 I was an employee of the Flathead Drainage 208 Project, a federally funded program to identify the non-point sources of pollution in the Flathead Drainage. The two year study concluded that one of the limiting nutrients to Flathead Lake was phosphorus. While the limiting of phosphorus from detergents may eliminate a small portion of the problem, this is a step at alleviating the algae bloom stage that threatens the condition of this lake and many lakes in Montana.

The attractive portion of this piece of legislation is that it is offered as a local option. Flathead County has a problem that may be unique to our area and this would offer an opportunity to take steps to help alleviate the problem and draw attention to the fragility of our ecosystem.

Northwest Montana depends on it's aesthetic qualities to attract tourists. Flathead Lake is an important part of our economy and water quality is a continuing concern. I urge you to support House Bill 711.

Thank you for your consideration.

Respectfully,

Virginia Burns-Sloan

cc: Rep. Cohen

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 8
DATE 032285
BILL NO. HB711

March 9, 1985
Randy Pau
P.O. Box 1654
Whitefish, Mt. 59901

Senate Committee on Natural Resources
Chairperson, Ms. Dorothy Eck

Dear Ms. Eck:

It has come to my attention that your committee will soon be debating the pros and cons of allowing local bans on phosphates in detergents.

I know that there are many arguments for you folks to consider, but feel I can offer some perspective on how a ban would possibly effect the consumer. I've been a grocery stock clerk for the last twelve years and have worked for stores both here in Montana and also in Wisconsin. The state of Wisconsin (as you are probably well aware), banned phosphates quite some time ago, and I was working for a store there at the time.

I can't stress strongly enough how little effect this changeover had on the consumers of that state. Every manufacturer of soaps already prepares their product with two different formulas, one with and one without phosphates. The brands carried in our store did not change at all. We carried every variety from generic, to our house brand, to the major labels (Tide, Oxydol, Ivory Snow, Bold III etc.). Also, there was absolutely no change in price, relevent to the changeover. The argument I've heard that people would be driving to other counties to buy their soap just doesn't hold water, because their favorite brands are currently being produced without phosphates. A ban would merely mean that we at the store level would have to monitor our incoming product more closely and would force warehouses that currently do not carry phosphate-free soaps to do so. Actually, from a consumer's standpoint, there is absolutely no reason that phosphates couldn't be banned nation-wide. The only difference between the two products is the pollution found in the water within the reach of detergents with phosphate. I also might add that as a consumer I've noticed no difference in the cleaning capability of either product.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 9
DATE 032285

I hope you and your committee find this information to be helpful.

Sincerely,

Randy Pau

RP/je

PUREX INDUSTRIES, INC.
5101 CLARK AVENUE
LAKEWOOD, CALIFORNIA 90712

CHAIRMAN OF THE BOARD
AND PRESIDENT

February 8, 1984

Mr. James A. Summers
North Carolina Department of Natural
Resources & Community Development
P. O. Box 27687
Raleigh, North Carolina 27611-7687

Dear Mr. Summers:

Thank you for your letter of January 25, 1984. I noticed that you sent copies to Mr. Edmisten of the Consumer Protection Division of the Department of Justice, Messrs. Evans and Walker, Co-Chairs of the Water Pollution Legislative Study Commission, and Mr. Allegood of The News and Observer. I am not addressing this letter to such persons or sending them copies since I am not familiar with the current state of proceedings in the matter. You enclosed in your letter to me a copy of a January 19, 1984 article in the Raleigh News and Observer. Such article sets forth recent allegations of the Soap and Detergent Association regarding no-phosphate laundry products.

Purex does not believe that all current members of the SDA support the SDA's position of opposing no-phosphate detergents. However, it appears that whoever "pays the piper, calls the tune" in the SDA. The income of the SDA is obtained by assessments of members and assessments of the important division of the SDA involved in this matter are based on a member's share of the market. The largest dues payer is the largest household products company and such largest dues payer is the largest marketer of phosphates in home laundry/cleaning products. Raw material suppliers, who also belong and pay dues to the SDA, are influenced by the enormous purchasing power of this one company. Other member companies of the SDA follow their own self interests by using their influence in the SDA to "tip the scales" in favor of phosphates. Purex some time ago resigned from the SDA.

The marketing strategy of these companies obviously takes cognizance of the increased credibility in promoting phosphates by having the SDA front for the pro-phosphate forces. Common sense also, for purposes of increased credibility, dictated that the marketer of phosphates should not be the source of substantiation of the claims in favor of phosphates. An outside firm in the past was employed to prepare a special report in

favor of phosphates. The report developed is known as the "Glassman-Oliver Report" and is entitled "Economic Analysis of Phosphate Control". There was little published material in support of phosphates. Thus, "private communications" between the authors of the report and the sponsoring parties became necessary. The private communications, forming the basis of the report, of course were with the large detergent companies committed to the continued use of phosphates. The Glassman-Oliver Report is often used by the SDA as substantiation for its pro-phosphate arguments. The article in the News and Observer reported statements made in North Carolina by the SDA which were developed from the Glassman-Oliver Report. However, the "costs to consumers" argument appears to be a revision. The original data showed a cost per family of $11.10. Your letter has the SDA now alleging "an average annual increase per family of about $26.18". The allegations we feel are false and unproven.

The Glassman-Oliver Report was commissioned and written in the latter part of the 1970's and some conclusions therein were based on material published some years earlier. The first no-phosphate detergents of any significance were made in the late 1960's or early 1970's. The formulations of the early no-phosphate products often were faulty. In the early years excessive washing soda was included in no-phosphate products. Data based on out-of-date studies and formulations cannot legitimately be used to impugn today's no-phosphate products. However, we feel the Glassman-Oliver Report is based on out-of-date testing and conclusions. For example, the report cites the testing by GE of 100% cotton shirting with a formula containing 70% sodium carbonate. No spray dried detergent today contains that level of sodium carbonate. Most detergents contain less than one-half such level. From the tests it was concluded there could be a reduction of 15% service life. Then, "if we assume that the rate of abrasion is linear ... we estimate a 25% to 30% loss in wear life" in water harder than the original tests. Finnally, they extrapolate without sound scientific evidence, based on all cotton garments of which there is low usage today, and based on inferior detergent products which are virtually non-existent today.

Even a greater absurdity is their approach to establishing a basis for higher energy costs when using a no-phosphate product. Instead of testing the solubility of phosphate vs. no-phosphate products in the laboratory or in the home, Procter and Gamble sponsored a telephone survey of 2750 homemakers as to whether they used hot, warm or cold water in washing. 500 of the respondents were in areas prohibiting phosphate detergents (the "ban areas"). The rest of the respondents were from phosphate areas (the "non-ban areas"). Procter and Gamble concluded from this study that people in the ban area used a warmer setting on their machines than people in non-ban areas. There was no consideration that the major ban areas were in the state of New

York and the city of Chicago (Miami was also included) where the ground water is colder and one might expect to use a warmer setting particularly in the winter months. There was no data base to show these people used a different setting on their machines before changing to no-phosphate products. This information was used to give a dollar figure ($6.45) which was over half the annual increase ($11.10) reportedly due to the use of no-phosphate products. This certainly is not true for Purex and Trend as these products are as soluble or more soluble than phosphate products and in some instances perform (clean) better than phosphate products as the water temperature is lowered. Procter and Gamble and the SDA used this same telephone survey to ask questions regarding usage of bleach, fabric softener, pretreatment products, extra detergent and water conditioners. There was no attempt to document habits before the non-phosphate products were used. The survey indicated the homemaker in the phosphate ban area used special treatment chemicals. The use of fabric softener is a function of winter temperatures, water hardness and personal preference. With colder weather and generally hard waters in the North one would expect an increased use of fabric softener, but this has nothing to do with the phosphate/no-phosphate controversy.

Why does the SDA say it costs more to use no-phosphate detergents even though Purex and Trend powdered detergents have lower average shelf prices in the grocery store? In 1981, Purex conducted a national survey based on average shelf prices and found that our laundry detergents saved the homemaker up to $27.68 per year. We used the same number of washes as the SDA which was 421 per year. This same number is valid today. Purex powdered detergent will save up to $20.00 per year and Trend powdered detergent up to $28.00 per year. Using a phosphate detergent is actually costing the homemaker money.

SDA excuses their reasoning on the basis they cannot single out one brand. They conducted the price survey using all non-phosphate detergents including liquid laundry detergents. We know liquids are more expensive on a per use basis. This skewed the SDA price results so they could claim no-phosphate detergents on the average cost the same as phosphate detergents; therefore, any additional costs due to energy or additives (which were wrong in the first place) would appear to be extra to the homemaker. This is another example of selective data treatment to prove the SDA point of view.

As a summary I will answer your questions in respect to Purex and Trend:

1) Costs the consumer about 20% more. There is no basis other than myth and innuendo for this. Actual shelf prices indicate Purex or Trend will save the consumer up to $28.00

per year. We hold discussions regularly with Whirlpool, a major manufacturer of automatic washing machines. Whirlpool has no indication that non-phosphate products decrease washer life. Any information on decrease in fabric life was connected (by GE) to early formulations, and even then conclusions were based on suppositions.

2) Costs consumers in North Carolina an increase of $60 million dollars per year or $26.18 per family. Based on the difference in product costs as shown above these numbers turn into savings not increases when using Purex or Trend.

3) Causes a buildup of limestonelike material on fabrics and appliances. As shown above, this is unsubstantiated for machine buildup. There isn't a shred of truth to this with regard to fabrics. If high levels of washing soda are used in a formulation, then there will be significant absorption on the fabric. With our formulations, absorption is at a low level. In fact, phosphates are absorbed too, and the most popular phosphate detergent contains about the same amount of washing soda as Purex no-phosphate products.

4) Uses more hot water to dissolve detergents. A complete fallacy bordering on defamation (as is the case of many of their statements). Purex and Trend are soluble over a wide range of water temperatures.

The stance of the SDA and its preferential treatment of one group of its members can be given a number of explanations. The power of an industry giant is not to be taken lightly. Purex Industries, Inc. is responsible and civic minded. Purex's products must meet needs not provided by others. Purex offers the consumer a product which will give good performance along with price/value. It appears that Lever Brothers has joined Purex in the last year. Lever was a strong proponent of the phosphate philosophy but has now changed its national laundry products into no-phosphate products. To Purex, this is recognition that Purex has been on the right path for the past ten years in providing true price/value laundry detergents to the consumer.

If you should have any additional questions, please contact me again.

Very truly yours,

W. R. Tincher
Chairman of the Board
and President

MONTANA HOME ECONOMICS ASSOCIATION

RESOLUTION 3: QUALITY OF WATER SUPPLY FOR HOME USE

WHEREAS Home economists because of their professional interest in promoting quality of life for individuals and families are concerned with environmental quality, and

WHEREAS Adequate and safe drinking water is essential to the health of all Montanans, and

WHEREAS The quality of water affects all Montanans with respect to drinking water supplies, recreation opportunities, fish and wildlife conservation, and local, county, and state economic development, and

WHEREAS The quality of home water supply can be improved by careful monitoring of water sources, their use and contamination.

BE IT RESOLVED THAT MEMBERS OF THE MONTANA HOME ECONOMICS ASSOCIATION SUPPORT AND ENCOURAGE LOCAL AND LEGISLATIVE EFFORTS TOWARD IMPROVING THE WATER QUALITY AVAILABLE TO MONTANA FAMILIES.

RESOLUTION4: HOME ECONOMICS IN THE PUBLIC SCHOOLS
JOB ENTRY vs LIFE ENTRY

WHEREAS Public schools have an obligation to educate all Montanans for a lifetime of productive, quality life, and

WHEREAS All students will not obtain a college preparation for their life's work, and

WHEREAS Learning styles vary and opportunities to apply information is a legitimate activity of public schools,

BE IT RESOLVED THAT The Montana Home Economics Association members are urged to play an active role in local community discussions regarding high school curriculums, to be an active proponent of the need for vocational subjects such as home economics to be readily available for both college bound and all other students in the secondary schools; and to make special efforts to work closely with those school personnel who establish secondary school schedules to assure that all students have easy access to scheduling home economics in their secondary school programs.

BE IT FURTHER RESOLVED THAT MHEA MEMBERS MAKE THEIR POSITION KNOWN TO MEMBERS OF THE BOARD OF PUBLIC EDUCATION REGARDING STANDARD FOR HIGH SCHOOL GRADUATION.

Resolution passed at Montana Home Economics Association April Meeting, April 7, 1984

DIL 2/28

Detergent ban passes in House

Rep. Ben Cohen's low-phosphate detergent bill easily passed the House on Tuesday and will be considered by the Senate next week.

House Bill 711 would give county commissioners the authority to ban the sale of detergents containing phosphorous.

It is designed to allow the Flathead and Lake county commissioners a way to cut down the amount of phosphorus entering Flathead Lake, where it has been found to encourage the growth of algae and hasten the lake's progress toward old age.

The House passed the bill 67-32 Tuesday despite a heavy lobbying effort by detergent manufacturers and chemical companies that say the bill will have little effect on the lake's phosphorus intake.

Cohen, a Whitefish Democrat, said bans or severe limits on the amount of phosphorus in detergents have been effective in Canada and many parts of the East and Midwest.

Dr. Jack Stanford, who has been performing the water quality studies on the lake, told the Flathead Basin Commission Tuesday that a phosphate ban would have a positive effect on Flathead and Whitefish lakes even if it cuts down phosphorus loading just a little.

The basin commission, meeting in Polson, unanimouly endorsed Cohen's bill by voice vote.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 12
DATE 032285
HB711

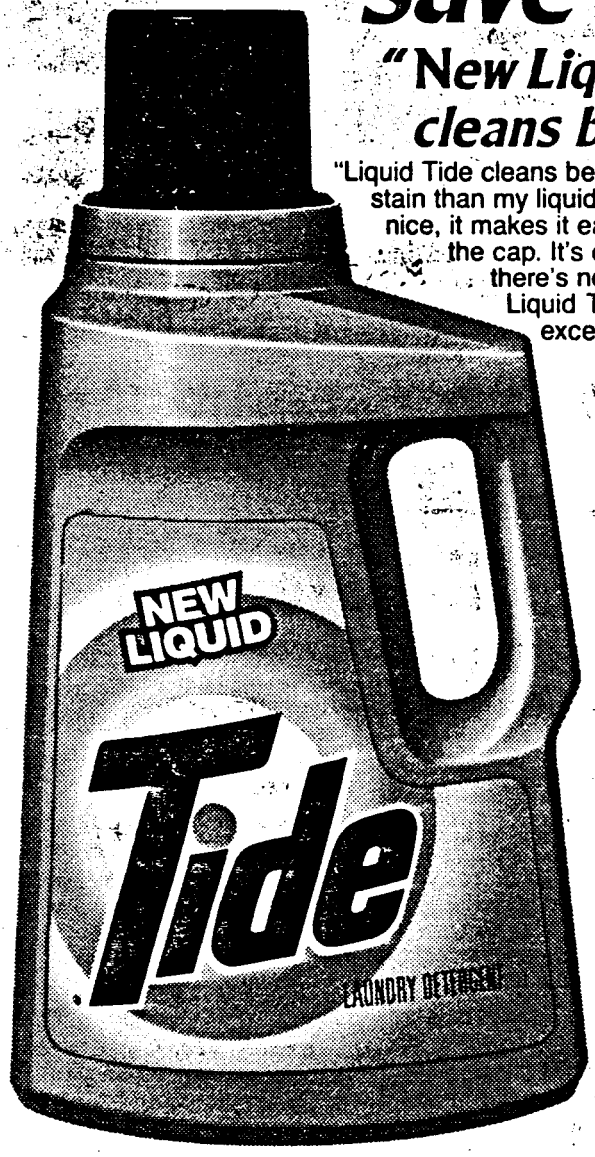
D/L 3/28 Thurs

NEW LIQUID TIDE

See the better clean and save 40¢

"New Liquid Tide cleans better."

"Liquid Tide cleans better on a tough blood stain than my liquid. And the spout is nice, it makes it easy to pour into the cap. It's convenient, there's no mess. Liquid Tide is excellent."



— CONNIE BARTELL
Bel Air, Maryland

OTHER LIQUID DETERGENT NEW LIQUID TIDE

Try Liquid Tide on some of your toughest laundry problems

You'll say it cleans better because you'll see it cleans better

8016TI

MANUFACTURER COUPON | NO EXPIRATION DATE

OR

save 40¢

when you buy

ONE any size LIQUID TIDE **OR** ONE any size TIDE POWDER

46696

46696

CONSUMER: Don't embarrass your dealer redeem this coupon ONLY by purchasing the brand size(s) indicated with its value deducted from retail selling price. Coupon may not be reproduced. Void if transferred to any person firm or group prior to store redemption. You pay any sales tax. Any other use constitutes fraud. LIMIT ONE COUPON PER PURCHASE.

DEALER: Your redemption signifies compliance with P&G Coupon Requirements dated 10 1 83. Free copy available by writing to PROCTER & GAMBLE 2150 Sunnybrook Drive Cincinnati Ohio 45237. Send properly redeemed coupons to same address. Cash Value 1 100 of 1¢.

8502

PROCTER & GAMBLE 276300

5 37000 12240

40¢

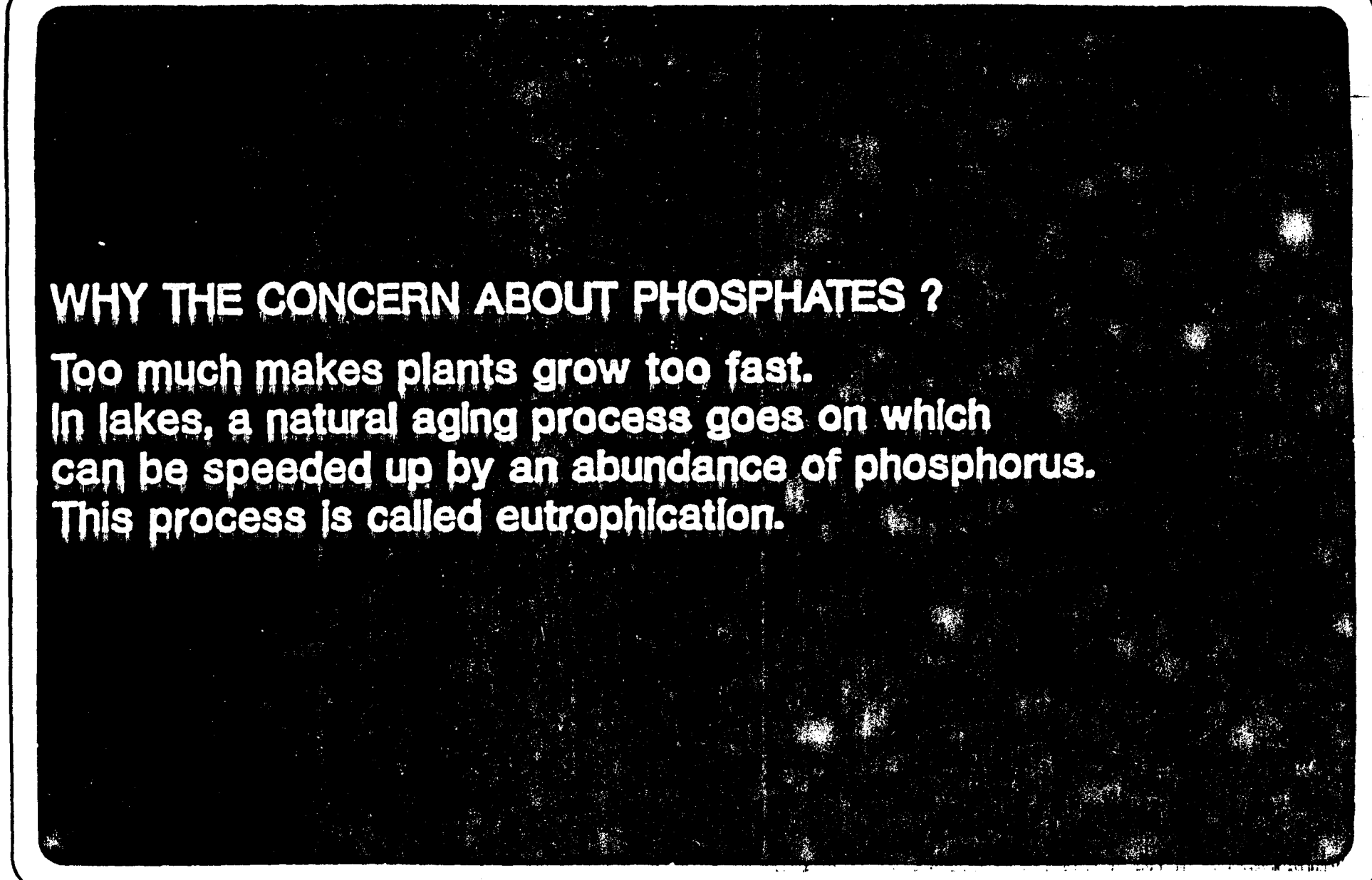
SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 13
DATE 03285
BILL NO HB711

WHAT IS PHOSPHORUS ANYWAY ? ISN'T IT TOXIC?

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 cottonseed oil, green peas, wheat germ, apricots, ice cream, detergents, fertilizers, baking powder, baby food, cereal, ham, Coke/ Pepsi, bran, mung beans, cabbage, milk, sunflower seeds, brazil nuts, etc.

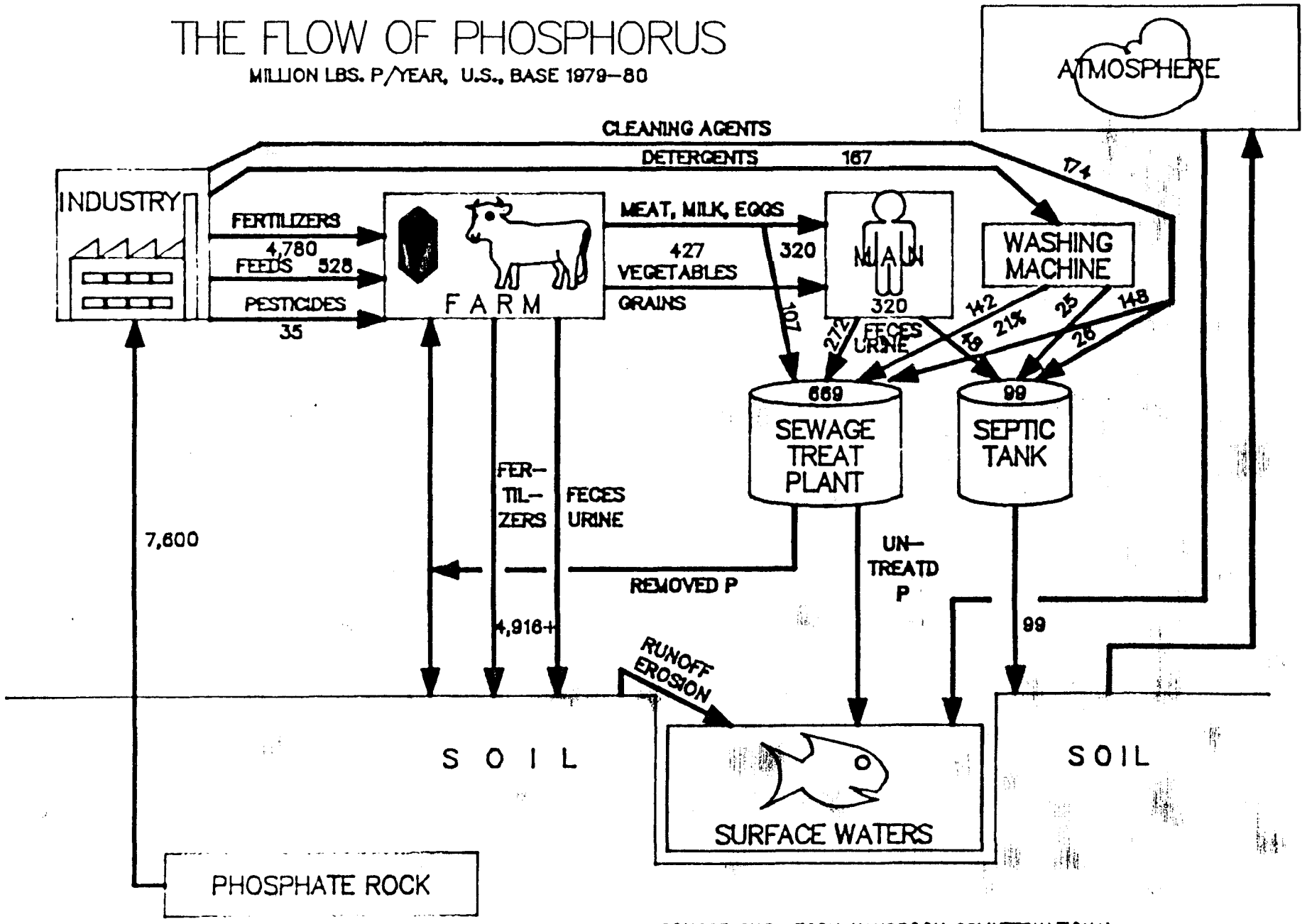
PHOSPHORUS CONTENT OF VARIOUS FOODS
(In grams)

1 LB POULTRY / TUNA / EGGS	0.9 GRAMS
1 LB BEEF / HALIBUT / WHEAT BREAD	1.1 GRAMS
1 LB CHEDDAR / SARDINES / BARLEY	2.2 GRAMS
1 LB DRY LENTILS / PEANUTS / SOYBEANS	2.2 GRAMS
1 LB WHEAT BRAN	6.5 GRAMS


WHY THE CONCERN ABOUT PHOSPHATES ?
Too much makes plants grow too fast.
In lakes, a natural aging process goes on which
can be speeded up by an abundance of phosphorus.
This process is called eutrophication.

THE FLOW OF PHOSPHORUS

MILLION LBS. P/YEAR, U.S., BASE 1979–80



SOURCE: CHEM. ECON. HANDBOOK, SRI INTERNATIONAL

CAN THE AMOUNT OF PHOSPHORUS BE CONTROLLED ?

Yes, especially from municipal sources of sewage. The most important method is proper water treatment plants. Non-municipal sources (farm/livestock runoff) are more difficult to control, but proper land management and no-till farming will make large contributions.

COMPARISON PHOSPHATE & CARBONATE BUILT DETERGENTS

S. S. Mohamed (University of Illinois)
Textile Chem. & Colorist, vol. 17, p. 37 (1982)

- Laundering with phosphate detergents gives significantly higher soil removal after 25 cycles
- Ditto for appearance
- Ditto for fabric strength
- Carbonate detergent caused severe abrasion and deterioration of cotton

MICROBIAL SURVIVAL IN DISHWASHERS

Schneider, Busta and McDuff
Journal Food Protection, vol. 41, p. 800-805 (1978)

After 15 dishwasher cycles, glass dishes washed in a non-phosphate detergent contained films with 4,000 times as many Bacillus Subtilis spores as those washed in a 7% phosphorus dishwashing detergent.

WHY WOULD A DETERGENT PHOSPHATE BAN COST MORE ?

Four Reasons:

1) Added Energy Costs from using more hot water
2) More Laundry Additives Used
3) Washing Machine Wearout
4) Clothes Wearout

THE COST OF WASHING CLOTHES
Purchase, Berning and Lyng (Cornell Univ., P&G)
Journal Consum. Studies & Home Ec., vol. 6, p 301 (1982)

- Study on 2,800 ban and non-ban panelists
- Phosphate non-availability increases costs 2.7 c per load, or $ 11.30/household-year
- In addition, washer maintenance costs increase
- In addition, wear life of garments decreases

ANALYSIS OF CONSUMER COSTS OF DETERGENT P BAN

Professor W. Kip Viscusi
Fuqua School of Business, Duke University (1983)

• Energy and laundry additive costs	$ 7.84
• Machine Repair Costs	$ 5.25
• Fabric Wear Costs	$ 9.79
• TOTAL (per household year)	$ 23.19
• Economic loss of decreased quality, add'l	$ 15.88

INDIANA DETERGENT BAN YIELDS LITTLE P REDUCTION

Professors J.E.Etzel and J.M.Bell (Purdue University)

Water Sewage Works, vol. 9, p. 91 (1975)

P levels in Indiana streams show that 18 months of ban failed to reduce P levels in the White and Wabash rivers.

IMPACT OF P BAN ON WATER QUALITY OF WISCONSIN LAKES

Prof. N. Clescerl, Rensselaer Polytechnic Inst.

- No significant water quality improvements in 7 lakes
- Small clarity improvement in Balsam Lake, but P and chlorophyll unimproved
- Large increase in chlorophyll in Elk Lake

EFFECTS OF P BAN ON WISCONSIN SEWAGE TREATMENT PLANTS (1971 compared to 1979)
Foth & Van Dyke & Associates, 76 pages (1981)

- Reduction of 18-26% in influent P loadings
- No impact on sewage treatment plants ability to meet 1 ppm phosphorus
- Total annual chemicalsavings $ 500,000 = 11 cents per capita

WATER QUALITY EFFECTS OF DETERGENT P BAN
Schuettepelz, Roberts and Martin
Wisconsin Department of Nat'l Resources (1982)

- Examined 13 Wisconsin stream sites and 3 lakes, 1976 - 1981
- No evidence of water quality improvement in 3 years of ban

EFFECTS OF P BAN ON LAKE WATER QUALITY IN MINNESOTA (1975 - 1980)

H.M. Runke, Envlronm. Res. Group, St. Paul MN

- Reduction in overall P budget 13% for point-source lakes
- No significant water quality improvement attributable to ban for 6 pairs of lakes

INTERNATIONAL JOINT COMMISSION
1981 Great Lakes Surveillance Report
Great Lakes Water Quality Board

1980: Of total phosphorus entering Great Lakes, an average of 14% comes from municipal discharges.

Figure 2
Algal Blooms.

Figure 3
Degree of Lake Erie Eutrophication.

associated with algal blooms and their decay are turbidity, odor problems, tainting of water supplies, and unsightly algal blooms, as shown in Figure 2. The degree of Lake Erie eutrophication compared to other Great Lakes is shown in Figure 3. Extensive research has shown that the major contributor to Lake Erie eutrophication has been the oversupply of phosphorus which stimulates excessive algal growth.

Sources of Phosphorus

Having recognized that phosphorus input is a major problem, it then becomes necessary to determine the sources of phosphorus to the lake. Major sources of phosphorus include Municipal wastewater treatment plant discharges which are referred to as "point" sources, and land runoff sources which are referred to as "nonpoint" or "diffuse: sources. Other sources include input from Lake Huron and fallout from the atmosphere.

Figure 4 illustrates estimates of present (1980) phosphorus loadings to Lake Erie from the various sources. There is, of course, yearly variability in inputs especially from land runoff. Total phosphorus loading is about 16,500 MT per year (multiply by 1.1 to convert to tons). About 4,500 MT per year is from point sources and 9,300 MT per year from nonpoint sources. Loadings have decreased from about 20,000 MT per year to the 16,500 MT per year level due to the construction of large municipal treatment plants in the basin which reduce phosphorus concentrations in effluent to 1.0 mg/l or less. As will be discussed, the costs of achieving further reductions through further removal of phosphorus at treatment plants is disproportionately high. Thus, the Lake Erie Wastewater Management Study (LEWMS) turned to achieving phosphorus reductions from land runoff. Investigation during the LEWMS program determined that of the 9,300 MT per year phosphorus load from non-point sources, 8,400 MT, or 51 percent, of the total lake loading is contained in runoff from rural land, principally agricultural cropland. Therefore, the LEWMS program was directed towards investigating how phosphorus runoff from cropland could be effectively reduced with practical cost effective methods which do not adversely affect crop yields or economic return to the farmer.

Lake Erie Phosphorus Loading Objective

The International Joint Commission (IJC), after intensive study of phosphorus inputs to Lake Erie and resultant effects, set a long-term total phosphorus loading goal of 11,000 MT per year. Attainment of this loading objective is expected to lead to a 90 percent reduction in the area of severe oxygen deficiency (anoxia) in the central basin of Lake Erie. The immediate IJC goal is to reduce nonpoint source loadings by 2,000 MT per year with 1,700 MT of that reduction from the United States.

RELATIONSHIP OF SOIL EROSION TO PHOSPHORUS LOSSES

As a prerequisite to developing a strategy for controlling phosphorus inputs to Lake Erie, it is necessary to understand how intimately phosphorus is attached to soil and the mechanisms for detachment and transport of sediment and phosphorus to the lake. Further, it is necessary to know the availability of the transported phosphorus for algal growth.

Phosphorus in the soil exists for the most part as compounds of low solubility. Even soluble phosphorus fertilizers quickly revert to insoluble forms. Thus, phosphorus compounds behave as if they were soil par-

Excerpt from Summary Report of The Lake Erie Wastewater Management Study, U.S. Army Corps of Engineers, Buffalo District, June 1983.

EUTROPHICATION AND PHOSPHATE CONTROL

Lee, Rast and Jones (Univ. of TX, Dallas)
Environm. Science & Technology, vol. 12 p. 900 (1978)

- Algal growth in many waters is P-limited
- Sewage treatment can reduce P to 1 ppm at a cost of a fraction of a cent / person-day
- Lake Erie: Major improvements in treatment plants have occurred
- A detergent P ban causes little or no improvement in water quality

REVIEW: IMPACT OF P LOADS ON WATER QUALITY

R. Anne Jones & G. F. Lee (CO State University)
Water Research, vol. 16, p. 503-515 (1982)

- Unusually complete 13-page review
- There is no technical justification for the EVERY LITTLE BIT HELPS approach to P load reductions to waterbodies
- It just leads to the public spending large amounts of money in the name of POLLUTION CONTROL with little improvement in water quality

IMPACT OF DET'GT P BANS ON RECEIV'G WATER QUALITY

Makl, Porcella and Wendt (Exxon, P&G, TetraTech)
Water Research, vol. 18, p. 893-903 (1984)

- Major review
- Consistent conclusion: Elimination of detergent phosphate has not measurably increased water quality

EUROPHICATION IN THE UNITED KINGDOM
Dr. J. W. G. Lund, Limnologist
(January 1980)

- Eutrophication is less of a problem than pollution
- Major cause is sewage and its phosphorus content
- Next is agricultural eutrphication
- No evidence that reducing P in detergents will solve problem
- Solution is to treat sewage

HB 711
Rep. Cohen
Amendments to Statement of Intent
Third Reading Copy

1. Statement of Intent
Page 1, line 10.
Following: "rule"
Insert: "(a)"

2. Statement of Intent
Page 1, line 12.
Following: "waters"
Insert: "; (b) may limit allowable phosphorus concentrations in household cleaning products to trace levels;
(c) may not include standards that would adversely affect public health through the restriction of any cleaning agent necessary for food and beverage processing or for health care services or facilities;
(d) may not include standards that would decrease the effectiveness of automatic dishwashing detergents or chemical water conditioners; and
(e) may not include standards that would restrict the use of detergents or other phosphorus compounds necessary for agricultural operations or industrial processes"

3. Statement of Intent
Page 1, line 13, through page 3, line 9.
Strike: page 1, line 13, through page 3, line 9, in its entirety.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 15
DATE 032285
BILL NO HB711

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.

Seventeed percent of the total phosphorus entering Flathead Lake comes from sewage treatment plants (STPs) that are not presently equipped to remove phosphorus. From 4 - 10% of the phosphorus entering the lake from the STPs comes from phosphate detergents. Moreover, algae in lake waters grows rapidly in presence of phosphorus from detergents, whereas about 60% of the phosphorus entering lakes from other sources is not biologically active (i.e. does not directly initiate algal growth). Based on my research, the Water Quality Bureau has developed a strategy for controlling phosphorus which includes upgrading STPs 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 STPs; 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 numberous 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. This may be especially important for the many small lakes surrounded by houses with individual drain fields.

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

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 16
DATE 032285
BILL NO HB711

STATEMENT OF PAUL J. HORVATIN

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

CHICAGO, ILLINOIS

The United States Environmental Protection Agency, Region 5, Chicago, appreciates this opportunity to present to this distinguished committee the information that we have concerning detergent phosphate bans in the Great Lakes Basin. In the basin, bans are currently in place in the states of Minnesota, Wisconsin, Indiana, Michigan, and New York and in many cities such as Chicago, Akron, Ohio. Canada also has a detergent phosphate limit.

The Great Lakes collectively represent 20% of all fresh water in the world. Over 45 million people live in the basin and depend on the lakes for drinking water and recreation. The lakes have experienced major water quality problems and ecological damage due to eutrophication from increasing nutrient loads. In the late 1960's and early 1970's, heavy nutrient loads led to massive algal blooms and decay which clouded the water, closed swimming beaches, depleted oxygen, and killed or drove away sports and commercial fish. By way of point and nonpoint source controls and detergent phosphate bans, the United States and Canada have and are jointly addressing the eutrophication problem and are witnessing the recovery of the Great Lakes.

In summary we can report the following findings experienced in the Great Lakes:

- Detergent phosphate bans have proved to be effective by substantially reducing the amount of phosphorus reaching treatment plants. Our results have shown phosphate bans produced a 23% reduction in total influent concentraton and a 32% reduction in influent phosphorus loading per capita per year.
- Reduced phosphorus loadings to septic tank systems due to detergent phosphate bans can reduce nutrient loads from failed systems

- There is a 47% reduction in the average cost per person per year for phosphrus removal at the treatment plant attributable to detergent phosphate bans. A conservative range would be from $2.44 to $1.29/capita/year to high as $4.88/capita/year.
- Detergent phosphate bans in the Great Lakes basin do work in those states and individual municipalities that have them.
- Enforcement and compliance with the detergent bans in the Great Lakes states and communities have not been found to be a problem.
- USEPA Region 5 supports reduction of phosphorus when necessary to maintain water quality including such measures as detergent phosphate bans and removal at wastewater treatment plants.
- Experience with phosphate bans has shown that non-phosphate detergents are accepted by consumers. The Wisconsin Center for Public Policy in Madison, Wisconsin completed an Information Verification Project in June 1984 on the issue of phosphates in detergents. They found that while only 22 percent of U. S. households are located in ban areas, 40 percent of U. S. households report using non-phosphate detergents. They also concluded that a ban makes a difference where there is untreated or inadequately treated water such as septic systems which are failing or defective, and treatment plants whithout phosphorus removal capability.

In summary we can report positive results from detergent phosphate bans. Cost savings are achieved at the treatment plant, phosphorus to the environment is reduced, non-phosphate detergents are accepted by consumers, enforcement is not an issue, and most simply, the bans work.

Lake Erie, which just a few years ago was declared dead, is on the mend. The lake has been cleaned up to such an extent that a premier walleye fishery has been established. This new found sports fishery has been estimated to be worth well over $350 million dollars per year in tourism and recreation.

APPENDIX D

STATUS OF LEGISLATION TO LIMIT THE PHOSPHORUS CONTENT OF DETERGENTS IN THE GREAT LAKES BASIN

JURISDICTION	DETERGENT PHOSPHORUS LEGISLATION			REFERENCES
	DATE EFFECTIVE	ALLOWABLE P(%)	DETERGENTS INCLUDED	
Illinois	None			1
Chicago	/71 to 06/72	8.7	- all cleansers	2
	07/72 to present	0.5	- detergents.	1-5
Indiana	01/72 to 12/72	8.7	- all cleansers	2,20
	01/73 to present	0.5	- excludes detergents used for cleaning in-place food processing and dairy equipment; phosphorus acid products including sanitizers, brightners, acid cleansers and metal conditioners; detergents used in household and commercial machine dishwashers; detergents used in hospitals and health care facilities; industrial laundry detergents; detergents used in dairy, beverage, food processing and other industrial cleaning equipment.	1-7, 20
Michigan	07/72 to 09/77	8.7	- all cleansers	2,8,17
	10/77 to present	0.5	- household laundry detergents	1-4, 9,18
	01/81 to present	14.0	- commercial machine dishwashers, dairy and farm operation cleansers; cleansers used in the manufacturing, preparation and processing of foods and food products including dairy, beverage, egg, fish, brewery, poultry, meat, fruit and vegetable processing.	19

Appendix D - cont'd.

DETERGENT PHOSPHORUS LEGISLATION				
JURISDICTION	DATE EFFECTIVE	ALLOWABLE P(%)	DETERGENTS INCLUDED	REFERENCES
Michigan - cont'd.				
	01/81 to present	28.0	- metal brighteners, cleansers & treatment compounds, corrosion or paint removers, conversion coating agent, rust inhibitors, etchant, phosphatizer, degreasing compound, industrial or commercial cleansers used primarily in industrial and manufacturing projects.	19
Detroit	(07/72)	(0.5)	- (City ordinance enacted but pre-empted by Act 226 - State of Michigan-above).	10
Minnesota	01/77 to present	0.5	- total ban	1-6, 11
	01/77 to present	11.0	- detergents used for household and commercial machine dishwashing.	12
New York	01/72 to 05/73	8.7	- household use, laundry use, other personal use, industrial uses except those for machine dishwashers, dairy equipment, beverage equipment, food processing and industrial cleaning equipment.	2,3,16
	06/73 to present	0.5		1-5,16
Erie County	05/71 to 12/71	8.7		6
	01/72	0.5		13
Syracuse	07/71	8.7		6
Ohio	None*			1,3,4
Akron	02/71 to 06/72	8.7	- excluded detergents used for machine dishwashers; dairy, beverage, food processing and industrial cleaning equipment.	2,14
	07/72 to 12/72	8.7	- all cleansers	14
	01/73 to present	0.5	- excludes machine dishwashers; dairy, beverage, food processing and industrial cleaning equipment.	2,4,5, 14

Appendix D - cont'd.

DETERGENT PHOSPHORUS LEGISLATION

JURISDICTION	DATE EFFECTIVE	ALLOWABLE P(%)	DETERGENTS INCLUDED	REFERENCES
Ohio	None*			1,3,4
Akron	02/71 to 06/72	8.7	- excluded detergents used for machine dishwashers; dairy, beverage, food processing and industrial cleaning equipment.	2,14
	07/72 to 12/72	8.7	- all cleansers	14
	01/73 to present	0.5	- excludes machine dishwashers; dairy, beverage, food processing and industrial cleaning equipment.	2,4,5, 14
Pennsylvania	None			1,3
Wisconsin	07/79 to 06/82**	0.5	- laundry detergents	1,2, 21
		8.7	- machine dishwashing detergents and medical and surgical equipment cleansers	21
		20.0	- chemical water conditioners.	21
Canada	08/70 to 12/72	8.7	- laundry detergents.	15,23
	01/73 to present	2.2		1,3,4 6,23

*A proposed 2.2% ban is under consideration. Sadewicz, John J. July 11, 1983: Personal Communication. Ohio Environmental Protection Agency.

**An reinstatement of the bans is under consideration, possibly commencing January 1, 1984. Schuettpelz, Duane H. July 12, 1983: Personal Communication. Wisconsin Department of Natural Resources.

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19. State of Michigan. 1980, Public Act No. 453.

20. Indiana Stream Pollution Control Board. IC 1971, 13-1.5-5. Phosphate Detergent Law. Public Law 174 passed in 1971, amended by Public Law 97 in 1972, and amended again by Public Law 117 in 1973.

21. State of Wisconsin. May 19, 1978: Chapter 375, Laws of 1977.

22. New York Environmental Conservation Law, Article 35. Proposed 3/4/75: Part 659 Household Cleansing Products.

23. Environment Canada. 1974: The Canada Water Act Annual Report 1973-1974. Information Canada, Ottawa.

TESTIMONY ON HB 711

John Wilson, Administrator
Montana Promotion Division
Department of Commerce

I would like to take a moment to share with you some of the results of a tourism marketing research study recently completed by the School of Marketing and Management at Montana State University. Among other things, the study sought information on what visitors do on their vacations and how they perceive Montana as a vacation destination.

When asked about boating, canoeing or rafting 51% reported that they engaged in these activities "sometimes" or "often" on vacations.

Similarily over 80% of these respondents rated Montana as "good" or "excellent" as a place to enjoy boating, canoeing or rafting.

Fishing was the most popular outdoor activity among the vacationers. ~~On the~~ 60% reporting that ~~fished~~, they fished "often" or "sometimes". Clearly they see Montana as a good place to fish. Over half of 50.8% rated Montana as "excellent" and an additional 40.5% rated Montana as "good".

Ironically, Canadians as a group indicated that spending time at the beach was something they liked to do. They rated Montana higher than all other groups as a place to "spend time at the beach." Clearly Canadians avail themselves of Flathead and Whitefish Lakes.

The point is that many people use lakes and streams as a primary vacation element and that in general they perceive Montana as having excellent water recreation activities.

Tourism is big business in Montana. It's big business made up of many small businesses--dude ranchers, outfitters, tour boat concessionaires, hoteliers, restauranteurs and the like.

In 1983, residents and non-residents spent $814 million on travel. The non-resident portion of that is $423 million.

Those expenditures fueled over 20,200 jobs, with 2,600 of those jobs being new jobs since 1979.

Travel is one of two basic industries that showed employment growth between 1979 and 1983. (15%)

Tourism is very important to specific portions of the state and less so in other portions of the state. One of the benefits of HB 711 is that counties may adopt it when it is in their best interest. From a tourism perspective Flathead County is a good example of a county which may wish to adopt phosphate standards.

Clearly tourism is important to Flathead County. It is obvious that the counties lakes, particularly Flathead and Whitefish Lakes are a significant draw for visitors.

I estimate that over $80 million is spent in Flathead County annually by visitors. Over 2,000 jobs can be attributed to these expenditures.

If Flathead or Whitefish Lakes get the reputation of being "polluted," whether it is true or not, that negative publicity would cause economic loss, both in terms of expenditures and jobs not to mention the forgone development opportunities.

Keeping Montana's waters clean is economic development. Giving counties which may be susceptible to phosphorous pollution problems the power to take proactive action to protect their resources and their economics makes good sense to us.

A Statement on the Bactericidal Benefits of Phosphates in Detergents

From the briefing I have received on House Bill 711, which would allow individual counties in Montana to adopt a model rule controlling the sale of phosphate-containing detergents, I understand that a question has been raised regarding the benefit of the phosphates in detergents for the destruction of bacteria on washed surfaces or fabrics. The invitation to appear here followed my comments on this question to an individual with the Montana Department of Health and Environmental Sciences; and I would like to limit my testimony to this question and not the basic one involved, that is the role of phosphates in eutrophication.

There is little doubt that with special respect to dishes and glasses, which is not really the issue here, phosphate-containing detergents are better cleaners, cleaning meaning the removal of soil and prevention of film formation and not necesarily the destruction of microorganisms although they would appear related. Phosphates, specifically trisodium phosphate, are added in rather high concentrations to detergents primarily for the purpose of sequestering (i.e. bind or tie up) calcium and magnesium (hardness) ions that interfere with the activity of the surfactant present and lead to formation of films. The absence of phosphates means dishes and glasses that lack shininess. The primary role of phosphates in detergents is not to destroy microorganisms; and in fact the antibacterial activity of phosphates is very modest.

There is no convincing evidence that phosphates are necessary in laundry detergents for the control of microorganisms on textiles, which is of special concern in public lodging facilities and medical care institutions. Repeated studies have shown that water temperature is the most critical factor in destruction of bacteria during laundering. Bacterial counts are also lowered

by agitation and dilution, the addition of bleach, and a drying cycle, sufficient to convince some that even low-temperature washing is acceptable for providing hospital laundry that is "hygienically clean," that is free of pathogenic microorganisms in the numbers necessary to cause disease.

One of the most relevant studies to this question was reported in 1980 from Econonics Laboratory, a private company located in Minnesota that is in the cleaning product business. The investigators used swatches of sheeting material inoculated with Staphylococcus aureus to examine the influence of detergent type and concentration, wash water temperature, soil load, cycle time and water hardness on bacterial survival during laundering. The most significant variable was water temperature. No difference was observed between a phosphate detergent with 25 or 12.5% sodium tripolyphsophate and a phosphate-substitute detergent containing polyelectrolyte as sequestrants. In one phase of this study the investigators added Staphylococcus aureus directly to 0.3% solutions of the two detergents and observed that the die-off after two hours exposure was less than 80% in both products. They attributed the bactericidal activity to the high pH and not the detergents; and observed that it was of no practical significance since the wash step was no longer than 13 minutes. This kind of bactericidal activity can be put into better perspective by realizing that chlorine at a concentration of 1 mg/l (0.0001%) and pH of less than 8.0 would destroy better than 99.99% of the same population of Staphylococcus aureus in 30 seconds!

I hope these brief comments are useful to you in your deliberations on this legislation.

LAKE COUNTY, MONTANA

POLSON, MONTANA 59860

March 18, 1985

Honorable Senator Dorothy Eck, Chairperson
Senate Natural Resources
Capitol Station
Helena, Mt. 59601

Re: House Bill 711

Dear Senator Eck:

The Board of Lake County Commissioners supports passage of the above bill which gives us the authority to prohibit the sale and distribution of certain phosphorous compounds, particularly phospate-built detergents. Studies indicate phosphorous is the major nutrient causing water quality deterioration in Flathead Lake. Therefore, we believe that it is appropriate that any decisions concerning use of phosphorous compounds should be made on the local level following thorough public notice, hearing, and debate.

We thank you for your consideration on this matter and encourage a 'Do Pass' on H.B. 711.

Sincerely,
Board of Lake County Commissioners

Mike W Hutchin
Mike Hutchin
Chairman

Harold Fitzner
Harold Fitzner
Member

Don Peterson
Don Peterson
Member

MH/HF/DP/rh

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 21
DATE 032285
BILL NO. HB711

Daily InterLake, Kalispell Tues March 19, 1985

Phosphorus ban backed unanimously by county officials

By JACKIE ADAMS
Of The Daily Inter Lake

County commissioners from Flathead, Lake, Lincoln, and Sanders counties Monday voiced unanimous support of a legislative bill that would enable counties to ban detergents containing phosphorus.

Purpose of the ban, which has been proposed by Rep. Ben Cohen (D-Whitefish), would be to slow the growth of algae and protect the water quality of lakes and rivers.

Commissioners of District 10, meeting in Kalispell, voted to support the bill after hearing comments from Dr. Jack Stanford of the University of Montana Biological Station at Yellow Bay. Stanford has conducted water-quality studies of both Flathead and Whitefish lakes.

Stanford said banning phosphorus detergents would only eliminate a small portion of man-caused pollution in Flathead Lake but might well be enough to keep the lake below the algae-bloom point. The lake, he said, now hovers just at the algae-bloom stage.

Stanford told the commissioners that detergents are the largest single source of phosphorus reaching the lake. Phosphorus runoff from agricultural lands in the Flathead Valley is not a major influence on the condition of the lakes, he said.

Acknowledging that a county-imposed ban on phosphorus detergents might be hard to enforce, Stanford said it would at least draw attention to the pollution problem. A number of states have outlawed phosphorus detergents, but the detergent industry has lobbied against the change in Montana.

In another action Monday, the commissioners opposed a plan to reduce the counties' share of receipts from Forest Service timber sales.

The Forest Service passes along to the counties 25 percent of its gross receipts from timber sales in order to make up for the fact that the counties cannot tax federal lands. (In Flathead County, about 80 percent of the land is government-owned.)

A proposal under consideration in Washington would give the counties 25 percent of net proceeds from timber sales, rather than 25 percent of gross revenues that the counties now receive. The commissioners said they would write letters protesting such a change.

Flathead County sometimes gets as much million a year in Forest Service receipts.

The county also benefits from two other programs to return federal money to the local level. Payments in Lieu of Taxes (PILT) supply a per-acre payment for federal lands within the county, and revenue sharing provides lump-sums that the county uses for capital improvements. Revenue sharing, which is also in danger of being cut or totally abolished, is furnishing money to build the county's planned criminal justice center.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 22
DATE 032285

DHES TESTIMONY
IN SUPPORT OF
HB 711

The Montana Water Quality Act states, in part, that it is the public policy of this state to conserve water by protecting and improving the quality for various beneficial uses. Montana Water Quality Standards for lakes state that water quality must be suitable for a variety of beneficial uses including swimming and recreational uses. Recent blooms of blue-green algae and the findings of 10 years of studies by scientists such as Dr. Jack Stanford have convinced us that the beneficial uses of numerous Montana lakes, especially Flathead Lake, are being impaired by excessive inputs of phosphorus. Because of this impairment, DHES developed in 1984 a "Strategy for Limiting Phosphorus in Flathead Lake." This document and its recommendations have been reviewed at public meetings within the Flathead Basin and have been favorably received. The recommendations identify steps to be taken by government agencies, local communities, and concerned citizens to reduce the amount of phosphorus entering Flathead Lake.

This strategy recognizes that phosporus is contributed to our waters through a variety of sources including municipal sewage treatment plants, surface runoff from agricultural and forest lands and subdivision activity. Control in this area is limited because Montana law recognizes that conditions resulting from reasonable land uses are natural. The strategy recommends that municipal sewage treatment plants be required to reduce the phosphorus in their discharges to 1.0 mg/l which would reduce total contribution by 17 tons/year. This recommendation is being implementd by revisions to their waste discharge permits. We are currently working with land management agencies to reduce non-point source surface runoff and erosion which contribute additional phosphorus. Livestock waste has been controlled by regulations adopted in 1972. Subdivisions located in proximity to lakes are being closely reviewed

to ensure that the proposed method of sewage disposal will provide adequate phosphorus removal. The strategy also recommends legislation to require the sale of low or phosphorus-free detergents in the area.

The use of phosphorus-free detergents would have several specific impacts:

1. It makes the burden of PO_4 removal more equitable as well as more effective. 30,000 people out of the 52,000 in the county are not connected to a municipal sewage system. They are contributors of PO_4 just as their neighbors in town. Limits on detergents would reduce their PO_4 contribution by 4 tons/year.

2. Reduced operation and maintenance costs - Less PO_4 in sewage means less that must be removed to meet discharge permit limits. Cost savings for the 4 municipal plants in Flathead basin are estimated at $60,000 to $100,000 per year.

3. The reduction in PO_4 discharged to state waters would occur immediately after the local ban was enacted. Each of the municipalities involved in the Flathead area is currently involved in engineering analysis of their plants to determine what modifications are necessary. Necessary modifications may take 1-3 years for a permanent solution, not just a band-aid approach.

We are convinced that the phosphorus content of detergents does not need to be limited in all parts of the state and we, therefore, support a bill that would allow local imposition of such limitations when necessary to protect a valuable water resource.

HB 711 LOCAL REGULATION OF PHOSPHOROUS DETERGENT USE

Testimony of Chris Hunter, Consulting Limnologist

My name is Chris Hunter, I am a consulting limnologist representing myself and the waters of Montana. I have worked for the past 13 years on the lakes and rivers of Montana including Flathead Lake, Whitefish Lake, Tally Lake and Lake Mary Ronan in the Flathead Basin as well as Tiber, Fresno, and Hauser Lakes. In addition I have worked on numerous rivers and streams.

The technical merits of this bill are irrefutable:

1. Phosphorous is the element responsible for the increased growth of algae in our western Montana lakes.

2. A prohibition on the sale of phosphorous based detergents is the most cost effective way of eliminating a large percentage of the phosphorous entering our lakes and rivers.

3. A prohibition on the sale of phosphorous based detergents is the least socially disruptive way of eliminating a large percentage of the phosphorous entering our lakes and rivers.

The soap industry, whom we have not seen in this state in the 6 years since they last arrived to kill an anti-phosphate bill, will produce several highly paid consultants who have done little or no work in Montana, to cloud the technical merits I have just spelled out. But I assure you that it is just scientific smoke and mirrors. When judging the technical merits of this legislation please listen to the people who have worked on Montana's waters and whose concern is with those waters, not a large stipend from the soap industry.

I want to briefly address the consumer aspect of this legislation. I am a bit of a clean fanatic-no ring around the collar or spotty wine glasses for me. My wife and I have been using non-phosphate detergents for the last 10 years. Our washer has never had any problem. We have gone through two kids in clothe diapers without diaper rash. And people do not refuse to eat or drink from our dishes when they are invited over for dinner. In short, despite the testimony you will hear later from the soap industry, it is possible to live a clean and normal life without phosphate based detergents. If this was not the case then I am certain that the six states which have had phosphate bans in place would have repealed them some time ago.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 24
DATE 032285

TESTIMONY

IN SUPPORT OF HB 711

BY

BRACE HAYDEN, EXECUTIVE DIRECTOR

FLATHEAD BASIN COMMISSION

Chairperson Eck and members of the Committee, my name is Brace Hayden and I am the Executive Director of the Flathead Basin Commission.

The 1983 Montana Legislature created the Flathead Basin Commission to "protect the existing high quality of Flathead Lake's aquatic environment; the waters that flow into and out of, or are tributary to the lake; and the natural resources and environment of the Flathead Basin."

Specifically, the FBC is charged with: monitoring the basin's natural resources; encouraging cooperation among basin resource managers; holding public hearings on the condition of the basin; supporting economic development without compromising the basin's aquatic system; and promoting cooperation between Montana and British Columbia on resource development in the Flathead Basin.

Commission members include representives of Flathead and Lake Counties, the Confederated Salish and Kootenai Tribe, the National

Park Service, the Flathead National Forest, the Montana Departments of State Lands and Health, the Montana Power Company, the Bonneville Power Authority and three appointees of the Governor representing industrial, environmental and other groups. Liasons to the commission include the British Columbia provincial government and the U.S. Bureau of Reclamation.

Phosphate loading in Flathead Lake has been a major item of concern to the Commission. Extensive testimony has been presented at Commission meetings by a variety of scientific experts.

In November of 1983, the Commission passed a resolution strongly urging that the Montana Department of Health and Environmental Sciences require the elimination of phosphorus as a condition of any wastewater discharge permit for municipalities discharging into Flathead Lake or its tributaries. Each of the affected communities are now on a schedule to install such facilities.

There is more that needs to be done, however. Less than one-half of the people in the Flathead area are connected to sewage treatment plants and significant amounts of phosphorus are being contributed from the use of phosphours detergents in these areas. A reduction in phosphorus levels in wastewater would also lower the taxpayer's cost of operating advanced sewage treatment plant systems.

After debating the pro's and con's of a local option phosphate bill, the Commission voted unanimously to support House Bill 711. For the record, I'd like to read Commission Chairman Elwin Bennington's March 8th letter to Senator Eck:

Dear Senator Eck:

The Flathead Basin Commission has passed a resolution supporting a local option ban on phosphate containing detergents.

The most scientifically accurate information which we have suggests that although a detergent ban would reduce phosphorus by a small amount it is an amount that may be very critical to the welfare of Flathead Lake. The phosphorus which now reaches the lake is present in a threshold amount which, if exceeded even by a little, would have a severe impact on the lake and subsequently upon the economy of the whole Flathead Basin.

Sincerely,

Elwin Bennington. Phd

Acting Chairman

Flathead Basin Commission

I'd be happy to answer any of the committee member's questions regarding the FBC's support of this important bill.

Thank you.

Box 1039
Polson, MT 59860
March 8, 1985

The Honorable Dorothy Eck
Chairman, Senate Natural Resources Committee
Montana State Captiol
Helena, MT 59620

Dear Senator Eck:

The Flathead Basin Commission has passed a resolution supporting a local option ban on phosphate containing detergents.

The most scientifically accurate information which we have suggests that although a detergent ban would reduce phosphorus by a small amount it is an amount that may be very critical to the welfare of Flathead Lake. The phosphorus which now reaches the lake is present in a threshold amount which, if exceeded even a little, would have a severe impact on the lake and subsequently upon the economy of the whole Flathead Basin.

Sincerely,

Elwin Bennington, Ph. D.
Acting Chairman
Flathead Basin Commission

cc: Brace Hayden
Executive Director

HB 711

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

March 22, 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.

TESTIMONY OF THE MONTANA COUNCIL, TROUT UNLIMITED

H.B. 711

SENATE JUDICIARY COMMITTEE

March 22, 1985

Madame Chairman, Members of the Committee:

My name is Mary Wright, and I represent the Montana Council of Trout Unlimited. TU is a nationwide fishing conservation organization with over 37,000 members in about 330 chapters. The State Council is the statewide governing body representing 10 chapters and one affiliated organization.

A principal goal of TU is the preservation and enhancement of trout habitat. There are many factors that influence the quality of cold water fisheries. One of the many factors is addressed by H.B. 711 for which we ask your support.

By permitting counties to adopt and enforce a ban on phosphate detergents, H.B. 711 provides the tools to control some of the phosphorus that people pressure adds to lakes. This increment of phosphorus contributes to rapid premature aging of lakes called cultural eutrophication. This rapid premature aging involves degradation of water quality and consequently of aquatic species. The bottom line for the cold water fishery is toxic algae blooms and reduced food and oxygen supply. Trout and other salmonid species, unable to survive in these conditions, are replaced by rough fish populations including suckers and carp.

Almost half of the visitor days to Flathead Lake in 1981 were spent fishing for the bull trout, cutthroat trout and other coldwater species in the lake. The economic value of the tourist industry in Flathead County is enormous. Tourism provided almost 20% of basic employment in Flathead County in 1978 and also benefitted suppliers of goods and services. Loss of these economic benefits, as well as loss of property values and aesthetics are the bottom line for the localities where cultural eutrophication is a problem in Montana.

TU asks you to support H.B. 711 to give the people in those localities the power to deal with the problem.

Thank you.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 27
DATE 032285
BILL NO. HB711

Testimony on HB 711
Montana Audubon Council
22 March, 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.

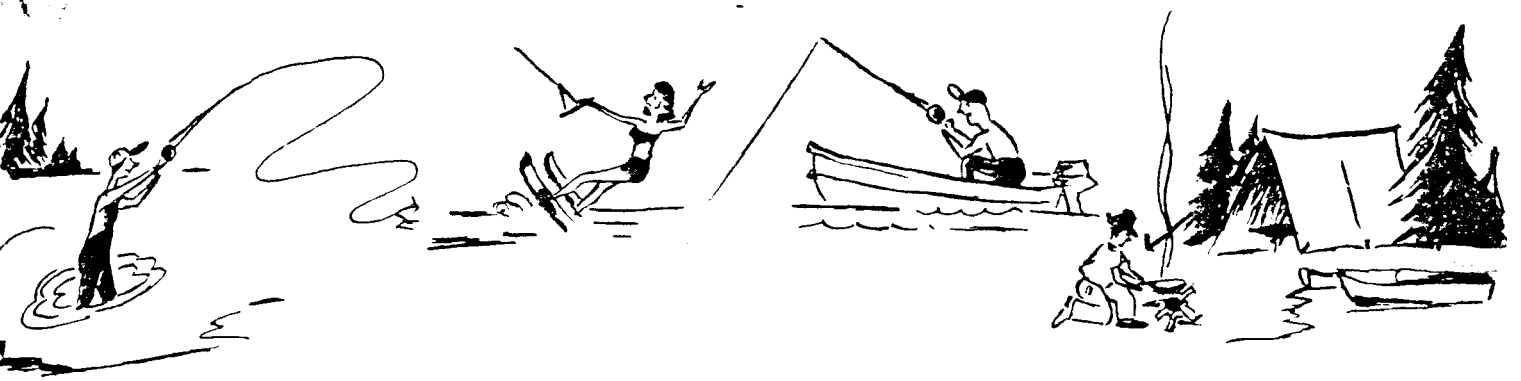
We support this legislation as a method to begin reducing phosphorus levels in our lakes now. This bill will also make a longterm contribution to reducing phosphorus levels in small lakes that are surrounded by houses serviced by septic tanks, lakes that are too small to be serviced by sewage treatment plants. Furthermore, HB 711 provides counties with an option in regulating phosphorus levels in their local lakes.

Banning the sale of phosphate containing detergents can significantly reduce the amounts of phosphorus entering our water systems. This reduction is significant because many of the lakes are on the threshold of rapid deterioration, and even small changes in phosphorus levels can be critical at this stage.

Clean and clear lakes can support a very diverse biological community, many species of fish and invertebrates can survive in these oxygen rich waters, and do in turn provide a food source for a wide range of birds and mammals. However, as lakes deteriorate algae growth increases, "aquatic litter" accumulates on the bottoms of these lakes and encourages the growth of aquatic plants. The water becomes dark, and oxygen content decreases. The result is that very few fish [redacted] can live in these murky lakes clogged with vegetation, and this effect is passed on through the food chain.

Excessive phosphorus levels are stimulating a rapid rate of deterioration in many large and small lakes. Audubon believes it is important to maintain these lakes as clean and healthy resources,so that they are able to support a wide range of species. To do this we must clearly reduce the amount of phosphorus entering our water systems. HB 711 takes a practical step towards phosphorus reduction. We hope that you will help protect Montana's biological resources and support HB 711. Thank you.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 28
DATE 032285
BILL NO. HB711



CANYON FERRY RECREATION ASSOCIATION

March 19, 1985

Senate Natural Resources Committee

RE: House Bill 711

The Canyon Ferry Recreation Association is concerned over the increase in algae growth at the heaviest used recreation area in the State. As you are all aware, during 1984 Canyon Ferry Lake experienced a heavy algae concentration which resulted in the presence of toxic algae. Recreation use at Canyon Ferry was drastically reduced due to algae growth and warnings of toxic conditions.

Nutrient enrichment of waters such as Canyon Ferry causes increased growth of algae and other aquatic plants, deterioration of fisheries and deterioration of water quality. Lakes and ponds become more and more eutrophic with age even in the absence of man, but man's activities can vastly accelerate the process. The detergent industry has attempted to convince the public that since eutrophication is a natural process, accelerating it does not constitute water pollution. However, ecologists believe that any material that speeds deterioration of the environment is a pollutant. In this case the non-toxic normally beneficial phosphate must be considered such a material.

Phosphorus is abundant in phosphate rock and is essential to all forms of plant an animal life. It is present in the food we eat and the beverages we drink. In fact, it is found just about everywhere, including the atmosphere. Phosphates have been used in large quantities for many years and have never been known to create a health or safety problem for people. Why then has there been such a controversy in recent years over phosphate in detergents? The problem is not that phosphate (PO_4^{-3}) is bad, but that it is too good. It causes things (particularly algae) to grow when no one wants them to grow.

Plants require many elements for growth. Chief among them are carbon, hydrogen, oxygen, nitrogen and phosphorus. The material that is in shortest supply (not in absolute amount, but relative to the amount needed) is known as the limiting factor, or the factor that, by itself, has the greatest effect on the growth of an organism.

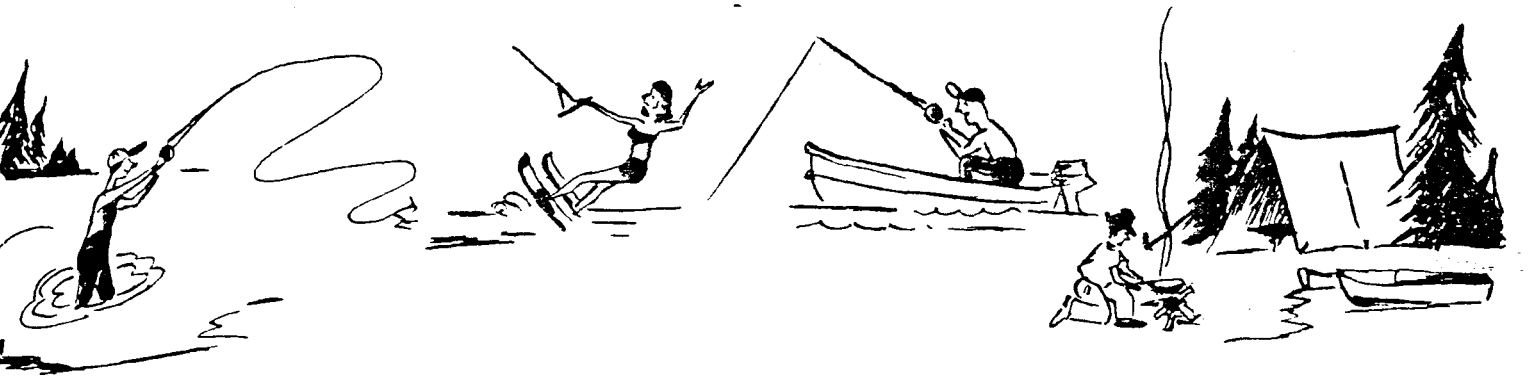
SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 29
DATE 032285
HB711

The limiting factor in eutrophication of a lake is not always phosphorus. Algae require fifteen to twenty different nutrients, and the one that runs out first will be the limiting factor. In most oligotrophic lakes phosphorus is usually the limiting factor, but it may be present in excess in nutrient-rich lakes. A very small increase in concentration can produce dramatic changes in a lake.

Although almost all of the publicity concerning the phosphate controversy over the past few years has involved detergents, there are other sources of phosphates. Present-day domestic waste water contains about 10 ppm of phosphorus, and about one-half to two-thirds of this is from phosphate detergents. The remaining one-third to one-half is from human and animal waste. Removing phosphates from detergents, then, will cut the phosphorus content of municipal waste water by 50%. This decrease in phosphate will certainly slow down the eutrophication process in many bodies of water around the State. The agricultural runoff (animal waste and fertilizers) would still be present, but a giant first step toward control of man-speeded eutrophication would have been taken.

We, therefore, members of the Canyon Ferry Recreation Association endorse the provisions of House Bill 711.

Robert C. McKenna
President
Canyon Ferry Recreation Association
916 North Park Avenue
Helena, Montana 59601



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SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 29
DATE 032285
HB711

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Although almost all of the publicity concerning the phosphate controversy over the past few years has involved detergents, there are other sources of phosphates. Present-day domestic waste water contains about 10 ppm of phosphorus, and about one-half to two-thirds of this is from phosphate detergents. The remaining one-third to one-half is from human and animal waste. Removing phosphates from detergents, then, will cut the phosphorus content of municipal waste water by 50%. This decrease in phosphate will certainly slow down the eutrophication process in many bodies of water around the State. The agricultural runoff (animal waste and fertilizers) would still be present, but a giant first step toward control of man-speeded eutrophication would have been taken.

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Robert C. McKenna
President
Canyon Ferry Recreation Association
916 North Park Avenue
Helena, Montana 59601

Jerome Anderson

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.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 30
DATE 032285
BILL NO. HB711

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 compli 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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THE IMPACT OF DETERGENT PHOSPHORUS BANS ON RECEIVING WATER QUALITY

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(*Received November* 1983)

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".

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†Author to whom correspondence and proofs should be addressed.

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

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 $\mu g\ l^{-1}$. 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

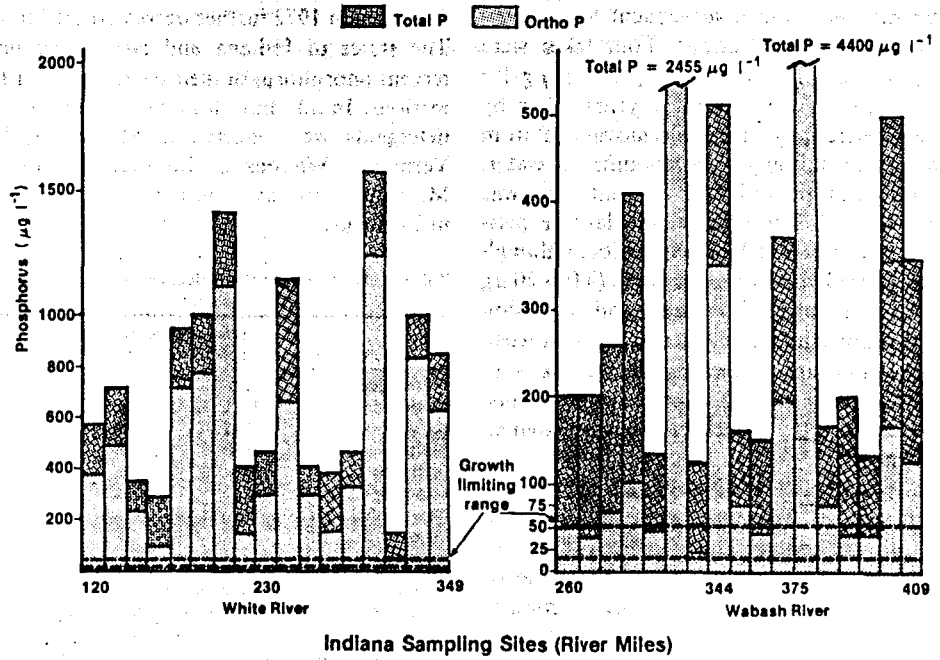

Fig. 1. Total and orthophosphorus data for the White River and Wabash River, Indiana showing presence of excess phosphorus concentrations beyond the growth limiting range (Etzel *et al.*, 1975).

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 $\mu g\ P\ l^{-1}$ 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

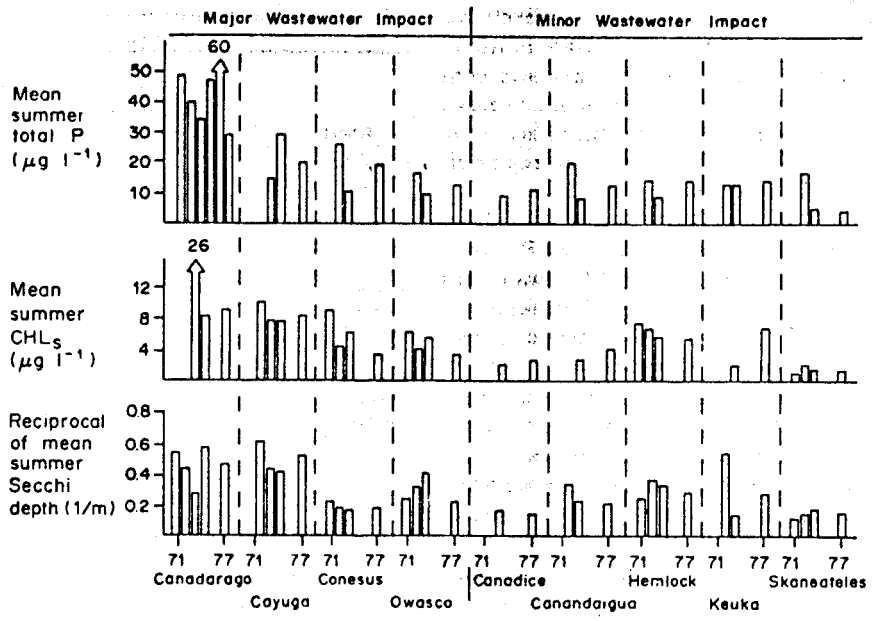

Fig. 2. Water quality data for the ten New York study lakes demonstrating variability in response patterns. The last bar for each lake represents 1977 data (4 years post ban) (Schaffner and Oglesby, 1978).

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

	Mean post-ban values minus mean pre-ban values			
Lake	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.

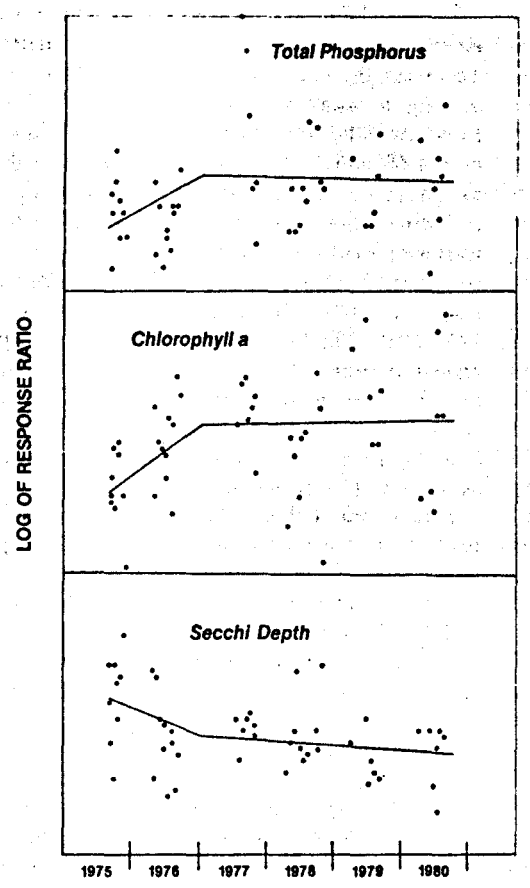

Fig. 3. Water quality data for the Blackhoof–Eagle lake pair, Minnesota demonstrating pre- and post-ban trends. The solid lines are the trends on the segmented-line regression model.

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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State of Montana
City of Helena
March 22, 1985

Remarks of E. F. Barth, P.E.
Barth Tec., Inc.
Cincinnati, Ohio

On March 2, 1985, I reviewed the report titled "Phosphorus Removal by Simultaneous Precipition at Existing Wastewater Treatment Plants with Application to Plants in the Upper Flathead River Basin", prepared by RSE, Engineers; and dated Feburary 5, 1985.

On March 19, 1985, I toured the wastewater treatment facility located at Kalispell, Montana. The tour was conducted by Mr. Olson, Plant Superintendent.

Prior to these two events, I have been involved with implementation of phosphorus removal technology for about 20 years.

Phosphorus removal technology is an established technology in municipal treatment plant operation. Attachment #1 shows that as of the year 1982, there were 586 municipal facilities in the United States that currenty employ phosphorus control technology.

Based upon the RSE, Engineers report and my tour of Kalispell it is my judgement; interium phosphorus removal technology could be quickly instituted at this facility.

Using the chemical, Alum, to control phosphorus residual in the plant discharge to the state limitation of 1 mg/l, would impose a capital cost of about $40,000. to $60,000. for this interim approach. Chemical cost for Alum would be about $59. per million gallons (table 14, page 28 of RSE report). This later cost falls within the range of costs for chemical addition cited in attachment #2 for 9 identified facities in the United States; and 15 generic facilities cited in Table 8, page 17 of the RSE, Engineers report.

These costs do not include other modifications necessary to meet other state imposed standards.

SENATE NATURAL RESOURCES COMMITTEE
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BILL NO. HB711

ATTACHMENT 1

TABLE 2. PHOSPHORUS AND NITROGEN CONTROL CAPABILITY OF THE UNITED STATES

Year 1982		Year 2000
	Phosphorus Removal	
586	Number of Facilities	1,233
(3,690 mgd) 14×10^6 m^3/d	Flow Treated	32×10^6 m^3/d (8,454 mgd)
14%	Percent of Total Flow	20%
	Nitrification	
686	Number of Facilities	2,880
(3,435 mgd) 13×10^6 m^3/d	Flow Treated	42×10^6 m^3/d (11,096 mgd
13%	Percent of Total Flow	27%
	Nitrogen Removal	
47	Number of Facilities	104
(237 mgd) 0.9×10^6 m^3/d	Flow Treated	3×10^6 m^3/d (793 mgd)
0.9%	Percent of Total Flow	1.8%

ATTACHMENT 2

Table 6. Phosphorus removal costs reported.

Plant	Design Capacity (mgd)	Total O + M Costs ¢/1 000 gal[a]	Chemical Used	P Removal Costs ¢/1 000 gal	P Removal Costs % of Total O & M	P Removal Costs ¢/lb P Removed[c]	Ref.
Grand Haven, Mich.	3.2	—	Pickle liquor	0.4	—	11[d]	6
Lima, Ohio	18.5	13.9	$FeCl_3$	1.3	9.4	36[d]	7
Gladstone, Mich.	1.0	35.0	Al	2.2	6.3	110[d]	5
Roanoke, Va.	35	19.0	Pickle liquor + Al	2.4	12.6	25[d]	4
Rochester, N.Y.	20	21.4	Al	2.5	11.7	65	2
Angola, N.Y.	3.1	48.2	$FeCl_3$	2.8	5.8	61	2
Blue Plains, D.C.	330	22.9	$FeCl_3$	4.0	17.5	112	3
Marlborough, Mass.	5.5	37.5	$FeSO_4$	5.1	13.6	99[d]	8
Ely, Minn.	1.0	91.6	Al	10.7	11.7	400	2

[a] 1 mgd = 3 785 m^3/d.
[b] 1 gal = 3.785 l
[c] 1 lb = 0.453 6 kg.
[d] Additional sludge handling cost not included in these P removal costs.

I would look forward to assisting you in any of the areas listed:

PROCESS EVALUATION	FACILITY PLANNING
PROCESS MARKETING	FEASABILITY STUDIES
MARKET POTENTIAL	PILOT PLANT STUDIES
NATIONAL TRENDS	DEMONSTRATION STUDIES
ENVIRONMENTAL IMPACT	PROJECT MANAGEMENT
PROPOSAL PREPARATION	PROCESS DESIGN
EXPERT TESTIMONY	TECHNOLOGY UPDATES
CONFERENCES	DESIGN MANUALS
SEMINARS	REPORT PREPARATION
WORKSHOPS	LITERATURE EVALUATION

To be successful in this venture these services must save you money and time, or offer that specialized capability you need. Typically my assignment would be portions of a larger project you manage; and I can expend detailed effort to suit your time frame.

Cincinnati, Ohio offers a favorable location for technical consulting activities. Within the commuter area, there are offices of 20 federal agencies, a consortium of 24 libraries, and 6 major universities. The Cincinnati Greater Airport provides 325 flights daily, by 12 scheduled airlines.

I have completed a profitable and rewarding career with the Office of Research and Development of the United States Environmental Protection Agency. I am now pursuing the above goals through services offered by Barth Tec., Inc. for environmental engineering and technical consulting.

A resume can be sent on request. If I can be of service I can be reached at:

Barth Tec., Inc.
877 Wismar
Cincinnati, Ohio 45230
Telephone: (513) 231-1966

SENATE NATURAL RESOURCES COMMITTEE
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BILL NO. HB711

RESUME

EDWIN F. BARTH

EXPERIENCE

1985 - Present	President, Barth Tec, Inc. Technical Consulting Cincinnati, Ohio
1970 - 1985	Chief, Biological Treatment Section Treatment Process Development Branch Wastewater Research Division Water Engineering Research Laboratory (formerly Municipal Environmental Research Laboratory) U.S. Environmental Protection Agency
1966 - 1970	Supervisory Research Chemist U.S. Department of the Interior Robert A. Taft Sanitary Engineering Center
1956 - 1966	Research Chemist (Organic) U.S. Department of Health, Education and Welfare Robert A. Taft Sanitary Engineering Center
1953 - 1956	Microbiologist, Shift Supervisor Chemical Solvents Corporation Terre Haute, Indiana

1970 - 1984:

Manage a national research effort on environmental control with a $2,000,000 per year budget. Supervise 3 national programs: Novel Process Development, Specific Pollutant Control and Microbiological Control. Both inhouse and extramural expertise is utilized. Conduct national and international seminars on findings from the three program areas. Serve as project officer and supervise other project officers doing extramural work. Interface with consulting engineers, directors of public works and lawyers to provide new technology directions. Assist States and EPA Regional Offices with implementation of engineering technology for pollution control.

Demonstrated ability to conceive engineering approaches, plan development work, and translate into full-scale construction of facilities.

Management skills to direct personnel and resources in a cost-effective manner to achieve stated goals in predicted time frame. Editorial skills to review and revise reports of complex engineering demonstrations. Experienced lecturer to both lay and peer groups for the purpose of technology transfer.

1966 - 1970:

In charge of pilot plant operations to evaluate effects of heavy metals on municipal wastewater treatment. Planned and executed extensive monitoring of various municipal treatment systems to correlate pilot plant data with full-scale data. Published book on findings. Developed novel wastewater treatment process for removal of phosphorus via pilot plant development. Additional pilot plant work produced frontier knowledge on control of nitrogenous pollutants in municipal wastewater. Led research teams to investigate nitrogen and phosphorus removal at 6 municipal treatment plants. Results published in peer reviewed journal. Trained municipal consultants in engineering design seminars.

1956 - 1966:

Isolation of trace organic compounds from environmental samples. Correlation of wastewater treatment efficiencies with removal of specific compounds. Determine fate of materials in bench-scale biological reactors. Under a Top Secret assignment from Ft. Detrick, Maryland, developed microchemical and microimmunological procedures for detecting biological agents in soil, water, and air samples. Produced a series of 31 reports detailing these findings. Provided training lecturers for the U.S. Public Health Service sanitary engineers to explain methods and procedures for tracking materials through municipal treatment systems.

State-of-the-art knowledge of advanced instrumentation such as infrared and ultraviolet spectrophotometers. Innovative techniques in biological separations such as gel diffusion and antigen-antibody reactions. Expert hands-on knowledge of design and operation of municipal wastewater treatment facilities. Presented technical lectures. Summarized complex research findings for publication.

1953 - 1956:

Supervised chemical and biological testing of antibiotics to insure sterility, identification and adherence to quality control requirements. Supervised first shift technicians producing the antibiotic cycloserine by extraction, ion-exchange and crystallization, and monitor recovery efficiency by controlled laboratory testing. This activity was a product of pilot plant development. This position required proficiency in understanding large scale biological fermentation, solvent extraction, ion-exchange, chemical analyses, microbial testing, crystallization, and pilot plant operation. Authored a manual on control testing procedures for determining recovery of the antibiotics penicillin, cycloserine and bacitracin after various unit process operations. Authored research report on direct recovery of the silver salt of cycloserine from fermentation broth.

EDUCATION

Microbiology, B.A. Degree — Miami University, Oxford, Ohio

Chemistry, M.A. Degree — Miami University, Oxford, Ohio

Qualified by the United States Office of Personnel Management as microbiologist, chemist, chemical engineer, and environmental engineer.

Registered Professional Engineer: State of Ohio.

AWARDS

Excellence of Service Award, U.S. Department of the Interior. "For contribution to transfer of technology at municipal design engineering seminars." 1964.

Thomas R. Camp Medal, Water Pollution Control Federation. "For the unique application of basic engineering research to nutrient control for municipal wastewater." 1971.

Federal Employee of the Year, Greater Cincinnati Federal Executive Board. "For distinguished service as a researcher and expanding recognition of EPA efforts." 1972.

U.S. EPA Bronze Medal, U.S. EPA. "In recognition of innovative research for controlling nitrogen and phosphorus in wastewater leading to environmental quality enhancement." 1976.

U.S. Patent #3,480,144, U.S. Patent Office. "Process for Removing Phosphorus from Wastewater." Inventors: E. F. Barth and M. B. Ettinger. 1969.

U.S. Patent #3,824,185, U.S. Patent Office. "Ammonia Elimination System." Inventors: D. Caldwell and E. F. Barth. 1974.

U.S. EPA Scientific and Technological Achievement Award. 1982. Co-author on research paper concerning biodegradation of priority pollutants.

Patent Disclosure: "The Nonox-ogen Process." Submitted, November 1984, (Co-inventor).

Four Merit Pay Increases, 1980-1984.

U.S. EPA Gold Medal for Distinguished Career of Outstanding Research; Janurary, 1985.

AREAS OF TECHNICAL EXPERIENCE

( ) = Cooperating Organization

PROCESS DEVELOPMENT:

Use of polymers in wastewater treatment. (Grand Rapids, MI)

Optimum secondary treatment selection. (St. Louis, MO)

Sequencing batch reactors. (University of Notre Dame, IN; Montgomery Engineers, CA)

Nitrogen deficient waste treatment. (Rex Chainbelt Co.)

Phosphorus control, chemical and biological. (Reno/Sparks, NV; University of Texas, Galveston, TX; Pontiac, MI; Marquette Univ., WI; Greene County, County, OH; Pomona, CA; Weston, Inc.; Brown and Caldwell, Inc.)

Detection of biological agents. (Fort Detrick, MD)

Biodegradation of specific organics. (U.S. EPA)

Bioaugmentation for enhanced treatment. (National Sanitation Foundation, MI)

Plastic media alternatives to rock media. (Dow Chemical Co.)

Ozone disinfection with ultraviolet light. (Upper Thompson Sanitation District, CO)

On-line wastewater instrumentation. (Seattle, WA)

Phosphorus loading to the Great Lakes. (Clarkson College, NY)

Nitrogen control, single and multi-stage. (Owego, NY; Hillsborough County, FL; El Lago, TX; Hatfield Township, PA; Gulf South Research, LA; Sarasota, FL; University of Notre Dame, IN)

Alernative hydrogen donors for denitrification. (Cornell Univ., NY)

Treatment of internal recycle streams. (Engineering Science, Inc.; FMC Corp.; Grace Chemical, IL)

Effects of heavy metals. (U.S. Public Health Service)

Technology evaluation. (Japan; Canada; Russia)

Lime treatment, single and two-stage. (Kansas State Univ., Manhatten, KS; Univ. of Colorado, CO)

Organic nitrogen control. (Stanford University, CA)

Column nitrification. (Stanford University, CA)

MUNICIPAL FACILITY ENGINEERING PLANS:

Provided guidance on the state-of-the-art of control technology for suitability of implementing facility plans to achieve effluent limitations. There have been 110 facility plans assessed. Technologies ranged from flow equalization to complex multi-stage nutrient control systems. Capital costs for these facilities have ranged from $200,000 to $409,000,000.

EXPERT WITNESS:

State of Michigan - Phosphorus Control (Twice)
State of Minnesota - Nitrification Processes
State of Ohio - Advanced Treatment Technology
State of Illinois - Nitrogen Control
City of Orlando, Florida - Rotating Biological Contactors

PRINCIPAL TECHNICAL REVIEWER FOR PROCESS DESIGN MANUALS:

Phosphorus Manual

First Edition - Black and Vetch, Inc.
Second Edition - Shimek, Roming, Jacobs and Finklea

Nitrogen Manual

First Edition - Brown and Caldwell, Inc.
Second Edition - Purdue University

Stabilization Ponds Manual

Clemson University

PUBLICATIONS

Thirty-one "Reports of Progress" for the Biological Warfare Laboratories, Ft. Detrick, Maryland. Contract No. FD 6-404-4982. April 4, 1956 through December 31, 1963. R. L. Bunch and E. F. Barth.

"Seriological Detection of Fermentation Wastes." Nature, 182, 1680, 1958. R. L. Bunch and E. F. Barth.

"Organic Materials in Secondary Effluent." Jour. WPCF, 33, 122, 1961. R. L. Bunch, E. F. Barth and M. B. Ettinger.

"High Molecular Weight Materials in Tap Water." Jour. AWWA, 54, 959, 1962. E. F. Barth.

"Effects of a Mixture of Metals on Sewage Treatment Processes." 18th Annual Purdue Industrial Waste Conference, Published in Proceedings, 1963. E. F. Barth.

"Effects of Heavy Metals on Biological Treatment Processes." Proceedings of the National Technical Task Committee on Industrial Waste, 1963. E. F. Barth.

"Organic Load and the Toxicity of Copper to the Activated Sludge Process." 19th Annual Purdue Industrial Waste Conference. Published in Proceedings, 1964. B. V. Salotto, E. F. Barth, W. E. Tolliver, and M. B. Ettinger.

"A Slug of Chromatic Acid Passes Through a Municipal Treatment Plant." 19th Annual Purdue Industrial Waste Conference. Published in Proceedings, 1964. J. N. English, E. F. Barth, B. V. Salotto, and M. B. Ettinger.

"Zinc in Relation to Activated Sludge and Anaerobic Digestion Processes." Jour. WPCF, 37, 86, 1965. G. N. McDermott, E. F. Barth, B. V. Salotto, and M. B. Ettinger.

"Summary Report on the Effects of Heavy Metals on the Biological Treatment Processes." Jour. WPCF, 37, 86, 1965. E. F. Barth, M. B. Ettinger, B. V. Salotto, and G. N. McDermott.

"A Field Survey of Four Municipal Wastewater Treatment Plants Receiving Metallic Wastes." Jour. WPCF, 37, 1101, 1965. E. F. Barth, J. N. English, B. V. Salotto, B. N. Jackson, and M. B. Ettinger.

Interaction of Heavy Metals and Biological Sewage Treatment Processes. U.S. Department of Health, Education and Welfare, #999-WP-22, 1965. Editor: E. F. Barth.

"Interrelation of Wastewater Treatment and Surface Water Quality: Inorganic Contaminants." Indiana State Association of AWWA State Meetings. Published in Proceedings, 1966. E. F. Barth.

"Mineral Controlled Phosphorus Removal in the Activated Sludge Process." Jour. WPCF, 39, 815, 1967. E. F. Barth and M. B. Ettinger.

"Anionic Detergents in Wastewater Received by Municipal Treatment Plants." Jour. WPCF, 39, 815, 1967. E. F. Barth and M. B. Ettinger.

"Managing Continuous Flow Biological Denitrification." 7th Industrial Waste Conference, Texas Water Pollution Control Association. Published in Proceedings, 1967. E. F. Barth and M. B. Ettinger.

"Chemical-Biological Control of Nitrogen and Phosphorus in Wastewater Effluent." Jour. WPCF, 40, 2040, 1968. E. F. Barth, R. C. Brenner, and R. F. Lewis.

"Upgrading Biological Treatment." Proceedings of Trenton, New Jersey Advanced Waste Treatment Seminar, 1967. E. F. Barth.

"Device to Aid Pilot Plant Final Settlement." Environ. Sci. and Tech., 2, 139, 1968. E. F. Barth.

"Treatment and Control of Phosphorus in Wastewater." Proceedings of Portland, Oregon Advanced Waste Treatment Seminar, 1969. E. F. Barth.

"Forms and Measurement of Nitrogen and Phosphorus." Proceedings of Portland, Oregon Advanced Waste Treatment Seminar, 1969. E. F. Barth.

"Design Consideration for Future Treatment Requirements." Proceedings of Albany, New York Advanced Waste Treatment Seminar, 1970. E. F. Barth.

"Phosphorus Removal from Wastewater by Direct Dosing of Aluminate to a Trickling Filter." Jour. WPCF, 41, 1932, 1969. E. F. Barth, B. N. Jackson, R. F. Lewis, and R. C. Brenner.

"Total Treatment Using Chemical and Physical Processes." Proceedings of 2nd Annual Sanitary Engineering Research Workshop, University of California, 1970. E. F. Barth.

"Digester Supernatant Treatment." Proceedings of the San Francisco, California Advanced Waste Treatment Seminar, 1970. E. F. Barth.

"Phosphorus Removal in Conventional Treatment." Proceedings of the Dallas, Texas Advanced Waste Treatment Seminar, 1971. E. F. Barth.

"Control of Nitrogen in Wastewater Treatment." Proceedings of the Dallas, Texas Advanced Waste Treatment Seminar, 1971. E. F. Barth.

"Perspectives on Wastewater Treatment Processes - Physical-Chemical and Biological." Jour. WPCF, 43, 2189, 1971. E. F. Barth.

"Design of Treatment Facilities for the Control of Nitrogenous Materials." Water Research, 6, 481, 1972. E. F. Barth.

"Nutrient Control Processes." 2nd U.S./Japan Conference on Sewage Treatment Technology, Proceedings, 1972. E. F. Barth.

"The Effects and Removal of Heavy Metals in Biological Treatment (A Discussion)." Proceedings of 1st International Conference on Heavy Metals in the Environment, Vanderbilt University, 1973. E. F. Barth.

"Plastic-Medium Trickling Filters for Biological Nitrogen Control." Jour. WPCF, 46, 937, 1974. G. A. Duddles, S. Richardson, and E. F. Barth.

"Physical/Chemical or Biological: Which Will You Choose?" Water and Wastes Engineering, Copyright Nov. 1974, Dun·Donnelley Publishing Corp. E. F. Barth and J. M. Cohen.

"Average pH." Jour. WPCF, 47, 2191, 1975. E. F. Barth.

"Degradation of NTA Acid During Anaerobic Digestion." Jour. WPCF, 48, 2406, 1976. L. Moore and E. F. Barth.

"Biodegradability of Benzidine in Aerobic Suspended Growth Reactors." Jour. WPCF, 50, 553, 1978. H. Tabak and E. F. Barth.

Advances in Water and Wastewater Treatment: Biological Nutrient Removal, Chapter 2, "Implementation of Nitrogen Control." E. F. Barth. Ann Arbor Science Publishers, Inc. 1978.

"Current Directions of Research on Wastewater Treatment." Proceedings of Union Carbide Symposium on Advanced Treatment, Tarrytown, New York, 1978. E. F. Barth.

"Nutrient Control by Plant Modification at El Lago, Texas." Jour. WPCF, 50, 1768, 1978. E. F. Barth and B. W. Ryan.

"Biodegradation Studies of Carboxymethyl Tartronate." EPA-600/2-78-115, July 1978. E. F. Barth, H. Tabak, and C. Mashni.

"Trends in Phosphorus Removal Technology for Municipal Wastewater Facilities." Proceedings of the American Chemical Society Annual Meeting, Miami, Florida, 1979. E. F. Barth.

"Biodegradation and Treatability of Specific Pollutants." EPA-600/9-79-039, October 1979. E. F. Barth and R. L. Bunch.

"New Secondary Treatment Processes for the 1980's." Proceedings of the Ohio Water Pollution Control Association Annual Meeting, Cincinnati, Ohio, 1980. E. F. Barth.

"Evaluation of Treatment Efficiency Measures." Proceedings of 8th Onsite Wastewater Systems Conference, National Sanitation Foundation, Ann Arbor, Michigan, 1981. E. F. Barth.

"Biodegradability Studies with Organic Priority Pollutant Compounds." Jour. WPCF, 53, 1503, 1981. H. Tabak, S. Quave, C. Mashni, and E. F. Barth.

"To Inhibit or Not to Inhibit: That is the Question." Jour. WPCF, 53, 1651, 1981. E. F. Barth.

"International Nutrient Control Technology for Municipal Effluents." Jour. WPCF, 53, 1691, 1981. E. F. Barth and D. Stensel.

"Sequencing Batch Reactors for Municipal Wastewater Treatment." 8th U.S./Japan Conference on Sewage Treatment Technology, Proceedings. 1981. E. F. Barth.

"Municipal Application of Sequencing Batch Reactor at Culver, Indiana." Jour. WPCF, 55, 484, 1983. R. L. Irvine, L. H. Ketchum, R. Breyfogle and E. F. Barth.

"Progress in Sequencing Batch Reactor Technology." Proceedings of 9th U.S./Japan Conference, Tokyo, Japan, October 1983. E. F. Barth.

"Effect of Heavy Metals on Municipal Wastewater Treatment Plants." 6th Annual Industrial Waste Treatment Workshop, Columbus, Ohio. September 1983. E. F. Barth.

"Implementation of Sequencing Batch Reactors for Municipal Treatment." Proceedings of 6th Symposium on Wastewater Treatment, Montreal, Canada. November 1983. E. F. Barth.

"Lagoon Effluent Polishing with Intermittent Sand Filters." Jour. of Environmental Engineering, 109, 1333, 1983. E. F. Barth, et al.

"Analytical and Process Considerations for $CBOD_5$ and BOD_5." Indiana Water Pollution Control Association, Indianapolis, Indiana. January 1984. E. F. Barth.

"Proceedings of a Workshop on Low-Cost Wastewater Treatment." Clemson University, Clemson, South Carolina. April 1984. Editors: E. J. Middlebrooks, E. F. Barth, M. H. Standeffer.

"Technology Evaluation of Sequencing Batch Reactors." M. L. Arora, E. F. Barth, M. B. Humphres. (In Press), September 1984.

"An Organic Loading Study of the Full-Scale Sequencing Batch Reactor at Culver, Indiana." R. L. Irvine, M. L. Arora, E. F. Barth. (In Press), September 1984.

"A View of Existing and Future Treatment Technology." E. F. Barth. (In Press), November 1984.

"Phosphorus Control and Nitrification Processes for Municipal Wastewater." USA/USSR Bilateral Agreement Seminar, Cincinnati, Ohio, December 21, 1984. (Proceedings Pending.)

Form CS-34
-79

NAME: MARC LORENZEN

ADDRESS: 2125 1ST Ave Seattle, WA 98121 BILL NO. HB 711

WHOM DO YOU REPRESENT Soap + Detergent Assoc. DATE 3/22/85

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Comments: Statement Attached

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 34
DATE 032285
BILL NO. HB711

Testimony Presented to Montana Senate
Natural Resources Committee

by Marc Lorenzen, PhD
Tetra Tech, Inc.
Bellevue, Wa.

March 22, 1985

My name is Marc Lorenzen. My qualifications to provide technical comments include a Bachelor and Masters degree in Environmental Engineering from the University of California at Berkeley and a PhD in Environmental Engineering from Harvard University. I did my Phd dissertation on eutrophication control and have been active in this field since 1967, when I first set up a research facility at Lake Tahoe, California. I have published papers related to phosphorus and algal growth in referreed journals such as Environmental Science and Technology and Limnology and Oceanography.

I was asked by the Soap and Detergent Association to review several technical documents related to Flathead Lake and comment on the effectiveness of a phosphate detergent ban on water quality and algal growth in the lake.

Having reviewed the limnological studies of Flathead Lake, I concur that a long term phosphorus control strategy is needed to prevent deterioration of the Lake and control algal growth. However it should be clearly understood that the methods used to predict lake response to phosphorus control are subject to a great deal of uncertainty. The models used in analysing Flathead Lake, originally developed by Dr. Richard Vollenweider, are typically accurate to within 20% and at best 10%.

Based on these methods, the estimated 3% reduction in phosphorus load that would result from a phosphorus detergent ban would not result in any measurable or visible change in water quality.

I recommend that the various sources of phosphorus to the lake be quantified and a cost effectiveness analysis be conducted to determine which control measures (or combinations) result in the most improvement at least cost.

I have discussed these comments with Dr. Vollenweider, who is the developer of the methods used by Stanford et al and would like to read his comments.

RSE, Incorporated

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 33
DATE 032285
BILL NO. HB711

Dr. R.A. Vollenweider
262 Townsend Ave.
Burlington, Ontario

March 19, 1985

Dr. M. Lorenzen
2125 First Ave. #1201
Seattle Washington
98121

Dear Dr. Lorenzen,

I have read with interest Standford's paper on Flathead Lake, and your assessment.

I agree with all points you make. The lake shows initial signs of eutrophication, and phosphorus control will be necessary. I concur with you that a 3% reduction of the total load, achieveable with a polyphosphate ban, would not lead to any measurable improvement of lake conditions. A phosphorus control programme should indeed be based on a comprehensive strategy which substantially goes beyond the polyphosphate question. Otherwise we may only delude the public, and unnecessarily detract public attention from the need for a more substantial remedial programme.

Yours sincerely,

Dr. R.A. Vollenweider

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 34
DATE 032285
BILL NO. HB711

Form CS-34
-79

NAME Awyer G. Payne BILL NO. HB 711

ADDRESS 4808 Cholet Dr., Cincinnati, OH 45217 DATE 3/22/85

WHOM DO YOU REPRESENT Procter and Gamble Co.

SUPPORT _____ OPPOSE ✓ AMEND _____

PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

Comments:

Statment attached

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 35
DATE 032285
BILL NO. HB711

P & G is a highly consumer-oriented company. We conduct the most thorough, sophisticated and realistic consumer research studies in the laundry detergent industry. When we tell you that one detergent product cleans one type of soil or stain better than another, you can believe that we have the results of hundreds of tests to support the claim. Our success is based on consumer confidence that our products will perform well and that they deliver value. Repeat purchases of our products is the ultimate consumer vote of confidence.

When you, the consumer, speak, we listen. In 1984, alone, we received almost 9,000 complaints about our non-phosphate laundry detergent products on our toll free 800 number that is printed on every carton. Dissatisfied consumers call us, they don't call their state Legislator or their Water Quality Board.

People prefer phosphorus detergents because they work better. In areas with free choice, as in the case of Montana today, they choose phosphate granular detergents by four to one over non-phosphate granular detergents. Tests done by the University of Maryland among others have demonstrated that phosphorus-based detergents work better. (Spivak) The newest liquid non-phosphate detergents on the market today can approach the cleaning performance of granular phosphate detergents on most soils, but their cost per use is about 40% higher.

Numerous studies of thousands of consumers show that when phosphates are removed from detergents, people use more hot water and laundry additives in an attempt to make up for the poorer cleaning of phosphate substitutes.[13,14] Detergent phosphate bans also impose additional costs on consumers because carbonate, the most common phosphate substitute, causes washing machines to break down more often and fabrics to wear out more quickly.[15,16] (Photos of G.E. washer from Coin-Op laundry in Indiana 1 year after detergent phosphate ban went into effect.) The U.S. Department of Commerce recognizes this economic impact and states that bans on detergent phosphorus cost American consumers close to an additional $500 million in 1980 alone.[17]

A ban would be an unneccessary "Hidden Tax" on Consumers.

Economic camparisons show the removal of phosphates from detergents is not cost effective compared to removal of the detergent phosphates at wastewater treatments plants.[9]

A.G. Payne
Procter & Gamble Co.
March 22, 1985
Montana HB 711
Senate Natural Resources Committee

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 35
DATE 032285
BILL NO. HB711

I am Peter Petch III, manager at Associated Food Stores, Helena Div. We are a food wholesaler & I am here to discuss the Effect (H.B. 711) will have on our business.

The major wholesalers operating in the State of Montana are - A. F. S. Helena & Billings distribute in ALL 56 counties WYO. N.D.

Ryans Great Falls & Billings distribute about 50 co... WYO.

Buttrey Foods - Great Falls distribute about 20 counties WYO, N.D. Ida, Wash.

Coming from out of State

Yarm Foods Grocery

West Coast Grocery } WASHINGTON

Safeway McLANCI - conv. stores

NASH FINCH North Dakota

Fred Meyer Portland Oregon

As a food wholesaler we receive product in quantity from 100's of mfg's, store it in racks & bulk storage, warehouse. As we receive orders from 100's of stores, these individual needs are pulled from the racks, loaded on trucks, up to maybe 20 different stops & 5 or more counties on a load, & delivered to the stores.

H.B. 711 states where as, such a limitation will not cause additional costs or burdens to consumer & retailers.

This will be a night mare for the whole sale industry. SPACE is money in ware housing & let me tell you this Bill will cost wholesalers a bundle. ~~Fact~~ It means double slotting in the racks for every Item. An Example is Tide with 9 sizes would under this BILL require 18 SLOTS. IT would require separate code # in the order Guide, Receiving personnel, Fork Lift operators, order fillers would need additional Training. Training costs money. Initially our warehouse cases on these products would be almost double as we wouldn't know who was going to buy phosphorus or non phosphorus. Eventually it would probably settle at about 1½ Times Present inventory. As non phosphate costs about 40% more than phosphate our cash outlay -

SENATE NATURAL RESOURCES COMMITTEE
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would be almost double what we need to invest now to take care of our customers needs. This will cost us more in interest to the banks besides increasing our storage & handling costs

Remember I used Tide as an Example. There are 18 more Items w. th many sizes for each

Who will be responsible for assuring that the correct product phosphate or non phosphate is ordered shipped To the stores? The wholesaler? The retailer? The Sheriff?

The wholesale industry is opposed To This Bill

IT is inflationary

Ambiguous - not clear

greater Problems w/ Advertising because of Price difference

COLUMBIA CHEMICAL COMPANY, INC.

1216 BOZEMAN AVENUE
HELENA, MONTANA 59601

AREA CODE 406: 442-6300
1-800-258-5571

March 22, 1985

HB 711 Testimony to Senate Natural Resource Committee

Madam Chairperson, Members of the Committee:

My name is Tom Joehler and I am the chemist for Columbia Chemical here in Helena. Columbia Chemical is the only manufacturer of cleaning and laundry products in this State. We are locally owned and operated and have no affiliation with any other nationally recognized firm. As a result we have a great deal of interest in this bill.

Let me preface my remarks by saying that we as a company and I personally have a great deal of interest in seeing to it that the water quality in this State does not deteriorate. I grew up in upstate New York on the shores of Lake Ontario and spent a lot of time in and around many of the finger lakes in New York. I saw first hand how eutrophication effected Lake Ontario and how the water quality in the finger lakes deteriorated. That was the major factor that prompted me to get my B.S. degree in chemistry and a Master's Degree in Environmental Science. The last thing I want to see is Flathead Lake undergo the same type of deterioration. Montana's pristine beauty and natural cleanliness are part of the reason I came to Montana, and I have no intention of leaving.

House Bill 711 however, does not get to the root of the problem. The problem is that Flathead Lake is showing some early signs of eutrophication. This may be due in part to elevated levels of phosphorus entering the lake. Given that this is the problem we must find the most effective means of reducing the amount of phosphorus entering the lake. It is a well established fact that sewage treatment is the most effective means of reducing phosphorus loading because it not only eliminates the 3% due to residual detergent but also eliminates that portion due to human waste and other municipal wastes.

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DATE 032285
BILL NO. HB711

In all, sewage treatment represents approximately 20% reduction in phosphorous loading, about 6 times that achievable by a phosphate ban. The entire idea of banning phosphates from detergents is unnecessary when in very short order the sewage treatment plants around Flathead Lake can and will be eliminating that very source as well as other municipal sources of phosphate. A phosphate ban is neither effective nor cost effective, it meerly deludes the general public into believing that their problem is being taken care of.

In areas that have enacted bans, studies have been at best inconclusive at showing that phosphate bans result in improved water quality. I site the Wisconsin Department of Natural Resources Report of 1982 on "The Water Quality Related Effects of Restricting the Use of Phosphates in Laundry Detergents" by Schuettpelz, Roberts and Martin, as well as Schaffner and Oglesby's "Study of New York Lakes" during the summer of 1977.

Now if we choose to ban phosphates from detergents, I think it only fair that the Senators and the general public know what they are giving up. The reason phosphates are used in detergent formulations is because they are the most cost effective agent for suspending and lifting soils from clothes without adversely affecting the clothes or washer. If effective substitutes were available they would most certainly be used, but they are not available. Sodium carbonate is the most common substitute used in powdered formulations, and it has disasterous effects on both chothes and washers as illustrated in these photographs from Appliance Manufacturer Magazine, November 1974. Liquids use a variety of substitutes some of which may come close to phosphate performance but at substantially high costs.

The following articles of clothing show clearly that under identical washing conditions phosphate based detergents are clearly superior to non-phosphate based detergents. These articles of clothing came from Evelyn Thompson of Thompson Editorial/AV Services of Oregon, Wisconsin.

An additional point I would like to make is that not only do phosphates clean dirt better, they also clean the germs and bacteria from all surfaces much better than non-phosphate detergents.

The following graph reprinted from the 23rd report by the committee on Government Operations; Phosphates in Detergents and the Eutrophication of American Waters, 91st Congress, 2nd Session, House Report No. 91-1004, April 14, 1970 shows this effect very clearly.

Khon and Riggs of Texas Woman's University showed in the 1980 American Ryestuff Reporter, volume 69, page 40 that bacterial counts were 8-10 times higher in fabrics washed with non-phosphate detergents than with phosphates. The sponsors of this bill have already seen fit to exempt dishwashing compounds from the total ban because of the bill's obvious sanitary implications. We maintain that phosphates are important in maintaining sanitary conditions and general cleanliness in healthcare facilities, hotels, motels, and households. I am not sure if hospitals, nursing homes, hotels, motels, you, your wife or husband would be happy with clothes that contain 8-10 times more bacteria than if you had used a phosphate based detergent.

In summation:

1) Phosphate loading to the Flathead drainage ecosystem due to detergents is so minor that a ban would result in no improvement in water quality. It would be like trying to control a gofer problem by poisoning three holes in a field of a hundred holes; the result is imperceptible.

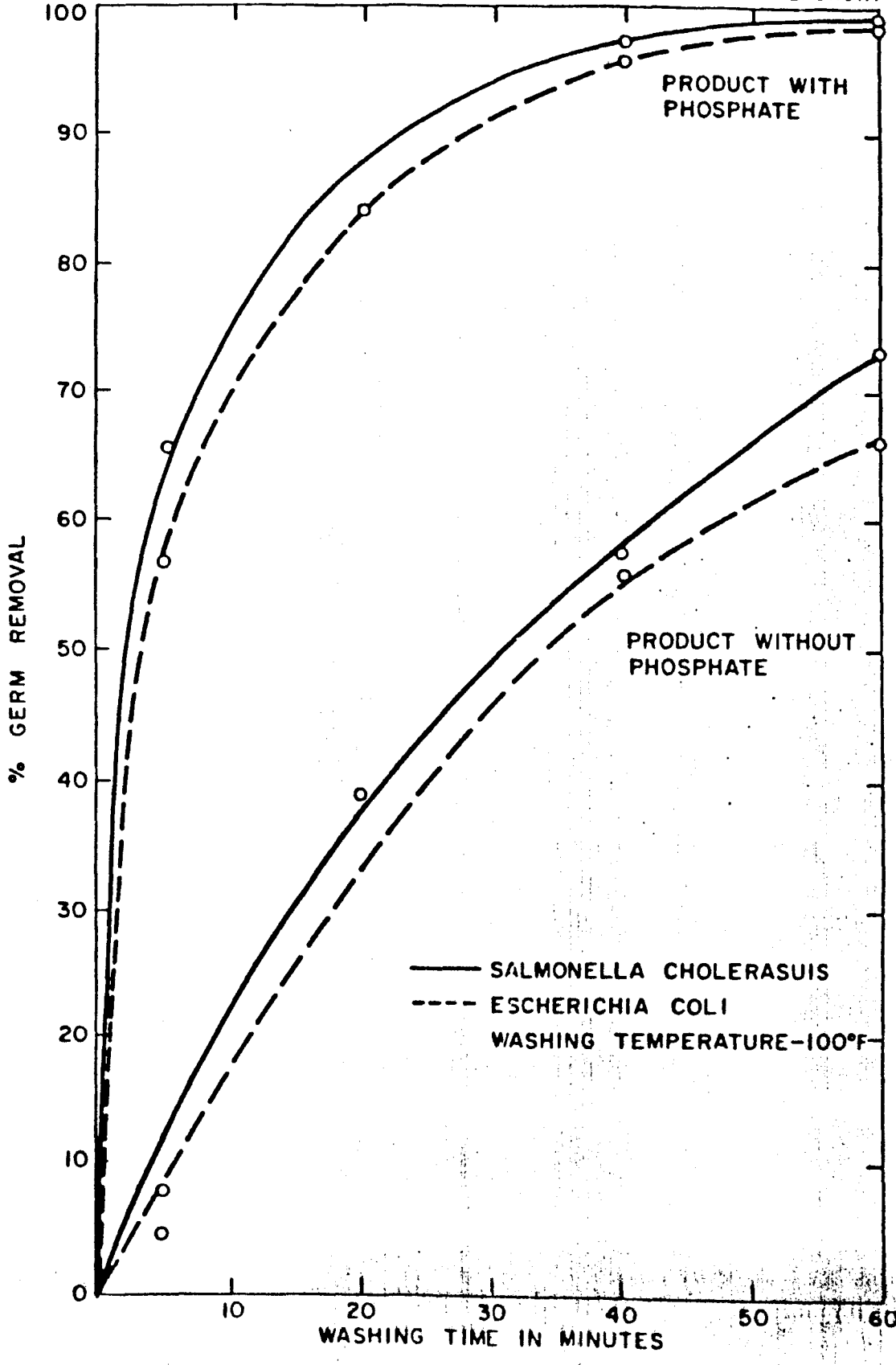
2) As a concerned citizen of this State I feel sewage treatment, which is already slated for the Flathead drainage, is a much better alternative than pressing the panic button by initiating a detergent phosphate ban to relieve the phosphate loading problem.

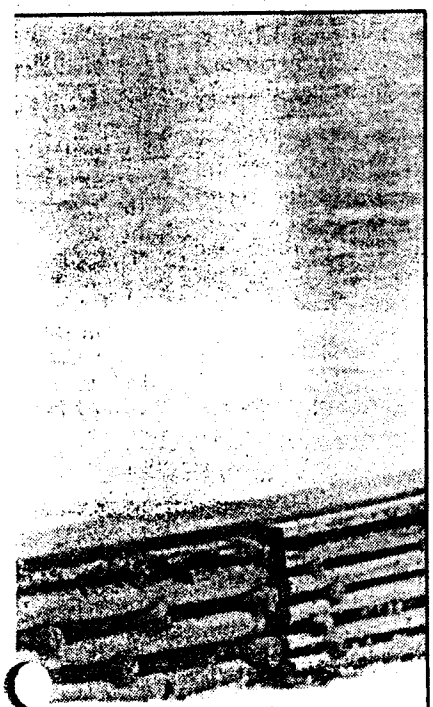
3) Phosphates are very important in cleaning and sanitation and to eliminate them from use means those individuals left without phosphate detergents are subject to less sanitary conditions.

I thank you for your time and hope that you give this testimony due consideration, and that you give HB 711 a DO NOT PASS recommendation.

Thomas H. Joehler

EFFECT OF PHOSPHATES IN DETERGENTS ON GERM REMOVAL IN THE HOME LAUNDRY





DENNIS JONES/Correspondent

's Riverside Park, but stubborn d temperatures melted a lot of es of flooding.

- Snow courses at higher eleva-

Counties bless plan to ban phosphorus

By DON SCHWENNESEN of the Missoulian

KALISPELL — County commissioners from northwestern Montana went on record Monday in support of a state bill that would give counties local authority to ban phosphorus detergents.

The District 10 commissioners, representing Flathead, Lake, Lincoln and Sanders counties, also said they will oppose any federal attempt to cut Forest Service payments in lieu of taxes to counties.

Lake County Commissioner Mike Hutchin, recently returned from a National Association of Counties meeting in Washington, D.C., said the Reagan administration seeks to cut county payments to 25 percent of net Forest Service receipts.

Currently counties receive 25 percent of the gross earnings from federal lands within the county, but the administration contends it is losing money because of payments in lieu of taxes, known as "PILT."

Hutchin, one of 50 county commissioners who met with Bureau of Land Management Director Bob Burford in Washington, said Burford "took extensive heat" from the counties over the PILT proposal.

Any change would require congressional approval.

Lincoln County Commissioner Ray Lindsey said the Forest Service originally paid counties 25 percent of the gross, but trimmed payments back to a quarter of the net several years ago.

"We worked about 10 years getting that changed" back to the gross method, said Lincoln County Commissioner Jim Morey.

The District 10 commissioners decided to write letters individually and collectively, to endorse the present method of computing Forest Service payments.

"People back there like to see paper, and the more of it the better it is," Lindsey said.

The commissioners also endorsed HB 771, a bill to give counties the option of adopting a local ban on phosphorus detergents.

The soap and detergent industry is waging a strong campaign against the bill, which has cleared the House and is headed for a Friday hearing before the Senate Natural Resources Committee in Helena.

Jack Stanford, director of the University of Montana Biological Station, said local phosphorus bans could eliminate a small but important part of the man-caused phosphorus pollution affecting Flathead Lake.

But he added that it could also benefit Echo Lake near Bigfork, Crystal Lake near Eureka, and many other small lakes where lakeshore homes and septic tanks are accelerating algae growth and degrading water quality.

With many phosphorus-free laundry products already on supermarket shelves, Stanford said he was mystified at the heavy industry opposition to the bill.

Asked how counties would enforce a local ban, Stanford said, "I don't think you can."

But he said a ban would raise public awareness of the phosphorus problem, and he predicted consumers would let storekeepers know if phosphorus detergents were still on the shelves in violation of a local ban.

He said western Montana residents are concerned about their lakes and rivers and want to protect them.

"I've never met anyone yet who didn't get concerned" when shown an obvious problem, such as a failing septic tank drainfield near a lakeshore, he said.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 38
DATE 03285
BILL NO. HB771

MONTANA CHAMBER OF COMMERCE
P. O. BOX 1730 • HELENA, MONTANA 59624 • PHONE 442-2405

What Is Illegal, a White Powder And Makes Colors Look Brighter?

By JOHN BUSSEY
Staff Reporter of THE WALL STREET JOURNAL

MILTON, Ky.—Beverly Davis, 52 years old, looks nice and sweet and innocent. But once a month she crosses the state line from her home in Madison, Ind., to this town of 800 people. She buys a container of powder and then drives back across the Ohio River to her home.

Where she uses it to wash clothes.

Her score? A box of Cheer laundry detergent containing outlawed phosphate. Mrs. Davis is a phosphate junkie. She can't cop the stuff in Indiana but it is sold legally in Milton. Milton store-keepers have opened their doors to the cross-border trade, even flaunting the powder's attributes. Mrs. Davis says: "Colors come out better."

Phosphate Lovers

Mrs. Davis and other die-hard phosphate lovers have been driven to bootlegging because six states—Indiana, New York, Minnesota, Michigan, Vermont and Wisconsin—have banned the sale of home detergents containing phosphate. Indiana has also banned their use, says the Soap & Detergent Association.

Scientists say that phosphate promotes excessive growth of algae in streams and lakes, which can lead to death of aquatic life. But some people will obviously do anything for a good, clean load of clothes.

Dottie McCord, who runs the Country General Store in Milton, can rattle off a list of soap flake customers for cities as far away as Muncie, Ind.—a good 110 miles distant. "I have regulars from Indianapolis," which is 93 miles away, she boasts. The record for the biggest Milton score, Mrs. McCord says, is held by an Indianapolis woman who paid more than $100 for five cases containing 20 of the big 10-pound, 11-ounce family-sized boxes.

Housewarming Present

Some phosphate fans employ other methods to get their fix. Floyd Hudson, who lives in New Jersey and works for Colgate-Palmolive Co., says friends in Middlebury, Vt., regularly invite him for visits—and ask him to haul along a case of Fab phosphate powder.

As for store owners in Milton, they're happy the way things are. Rowlett's Grocery has put a big "Tide" poster in its window and a display box of Oxydol on the front porch. And outside Riverside Produce & Grocery, big boxes of detergent on concrete posts beckon passing motorists. A beaming Kenneth McCoy, who helps run the store, says, "We sell a lot of soap powder."

WSJ 2-26-85

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 39
DATE 032285
BILL NO. HB711

Chad Smith

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.

March 22, 1985

1 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.

2 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.

3 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.

4 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 2-3 times as much**, 1.7-2.9 grams of phosphorus.

SENATE NATURAL RESOURCES COMMITTEE
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DATE 032285
BILL NO. HB711

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 support 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.

11 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.

12 The difference in bacteria is just as measurable in washing clothes. Khan and Riggs of Texas Womens University have reported in the 1980 American Dyestuff Reporter, Volume 69, page 40 that **bacterial counts in washing fabrics** with non-phosphate detergents **were 8-10 times higher** at gentle, colored, or wash-and-wear conditions and air-drying. These are frequent washing conditions, used every day. **Presenting no alternatives to bacteria on their clothing to residents of Flathead County** may create a greater problem than removing 3% of their phosphate solves. Constituencies should clearly understand the risks of detergent bans and of inferior alternatives.

13 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 separating 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.

14 House bill No. 711 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.**

15

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.

16

The bill states 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.

17

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 plants' abilities 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.

18

What about the Great Lakes in general? The Great 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.

19

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.**

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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 measurably increased water quality.

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Indeed, Dade County (**Florida**), the first area to enact a detergent phosphate ban in 1972, **recently repealed this archaic measure** which had outlived its usefulness.

I would be glad to discuss in further detail 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 universally prevalent material essential to life,

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

22

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** in our universe 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.

Office Memorandum

STATE DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES

TO : Steven L. Pilcher

DATE: February 28, 1985

FROM : WQB--Permits and Construction Grants

SUBJECT : Flathead River Basin Project Status

After developing the strategy to limit the phosphorus entering Flathead Lake, both permits and construction grants began working with municipalities within the basin to meet the proposed 1.0 mg/l phosphorus effluent limit. The following is the status of each community:

BIGFORK

Construction Grants:

-- A grant made September 14, 1984 for $1,932,000. This was 80.5% of the proposed project costs (see grant agreement fact sheet for proposed project description).

-- The financial analysis for the project costs was as follows:

	TOTAL PROJECT	PORTION ATTRIBUTED TO AWT (Advanced Wastewater Treatment
Capital Costs	$2,500,000	$220,000
Annual O & M	$108,000	$25,000
Annual Capital Costs and O & M	$212,800	$33,500
Number of Households	710	710
Annual Cost per Household	$300	$47
% Annual Household Income	1.9%	0.3%

-- Design of facility is approximately 50% complete. WQB is concerned about plant operation and maintenance. The facility will require increased O & M over other alternatives.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 41
DATE 032285
BILL NO. HB711

Permits:

On October 23, 1984, Bigfork received renewed MPDES permit MT-0020397. The permit included interim limits and final limits with a 1.0 mg/l total phosphorus limitation.

On November 20, 1984, Bigfork submitted a compliance schedule setting forth dates when final effluent limits would be attained. Following is that Compliance Schedule:

a)	Completion of Facility Plan	July, 1984
b)	Completion of Final Plans	April 15, 1985
c)	Award of Contracts	August 15, 1985
d)	Commencement of Construction	November 15, 1985
e)	Completion of Major Construction Phase	July 15, 1986
f)	Completion of All Construction	September 15, 1986
g)	Attainment of Operational Status	November 15, 1986

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
WATER QUALITY BUREAU

TED SCHWINDEN, GOVERNOR

Room A-206
COGSWELL BUILDING

STATE OF MONTANA

HELENA, MONTANA 59620
(406) 444-2406

GRANT AGREEMENT/AMENDMENT FACT SHEET

SUBJECT: Region VIII, Regional Administrator
Concurrence of New Grant

FROM: Department of Health and Environmental Sciences
Water Quality Bureau

TO: Project File

Grantee: Flathead County (Bigfork), Montana

Project Number: C300209-94

Project Step: Step 2+3

New Grant: $1,932,000.00

Summary Narrative:

a) Need: Bigfork is a small, unincorporated town of 1,589 summer residents in the proposed wastewater service area located on the northeast shore of the Flathead Lake at the mouth of Swan River. Wastewater generated within the proposed wastewater service area is treated either by an obsolete trickling filter treatment plant or by onsite treatment systems. The existing treatment facility is unable to meet its existing or future waste discharge permit limits. The effluent must meet secondary treatment standards as well as a phosphorus limit of 1.0 mg/l total phosphorus. The existing onsite systems are believed to inadequately remove phosphorus from the wastewater.

b) Project Description: The proposed treatment facilities include the construction of the following facilities: flow equalization, raw sewage pumping, primary clarification, three-stage trickling filter, chemical addition for phosphorus removal, effluent filtration, disinfection, surface disposal, aerobic digestion of sludge, sludge storage, and land application of sludge.

Major Cost Items:

a) Design Engineering . . . . . .$ 120,300.00
b) Construction Engineering . . . . . .undetermined
c) Construction $2,021,500.00

Total Eligible Cost/EPA Share: $2,4000,000.00/$1,932,000.00

KALISPELL

Construction Grants:

-- A grant was made September 14, 1984 for $1,305,000. This was 75% of the proposed project costs (see grant agreement fact sheet for proposed project description).

-- The financial analysis for the project costs was as follows:

	TOTAL PROJECT	PORTION ATTRIBUTED TO AWT*
Capital Costs	$1,460,000	$1,045,000
Annual O & M	$102,000	$102,000
Annual Capital Cost and O & M	$159,000	$151,000
Number of Households	3,725	3,725
Annual Cost per Household	43**	41
% Annual Household Income	0.3%	0.3%

*Includes phosphorus and ammonia removal.
**Excludes existing debt retirement and O & M: existing rates range from $10-15/mo/user.

-- The design of the AWT facility was put on hold by the MDHES until completion of an intensive stream survey on Ashley Creek. Preliminary indications are that during certain periods of the year, discharge to Ashley Creek will not be permitted.

Permits:

A preliminary environmental review (PER) is being prepared for proposed permit modifications which will include a final effluent limitation of 1.0 mg/l total phosphorus. The PER is scheduled for completion March 31, 1985. At that time, Kalispell's MDPES permit will be modified and require submittal of a compliance schedule setting forth dates when final effluent limits will be attained.

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HELENA, MONTANA 59620
(406) 444-2406

GRANT AGREEMENT/AMENDMENT FACT SHEET

SUBJECT: Region VIII, Regional Administrator
Concurrence of New Grant

FROM: Department of Health and Environmental Sciences
Water Quality Bureau

TO: Project File

Grantee: Kalispell, Montana

Project Number: C300263-94

Project Step: Step 2+3

New Grant: $1,305,000.00

Summary Narrative:

a) Need: The city of Kalispell, through extensive wastewater facilities planning, has identified four major wastewater treatment deficiencies at their existing plant: sludge treatment; primary and secondary treatment; phosphorus removal; and ammonia removal. The city is currently constructing a new sludge handling system under an EPA grant. The city needs a more reliable and efficient pretreatment facility, phosphorus removal facility to achieve 1.0 mg/l total phosphorus to protect Flathead Lake water quality, and nitrification facilities to protect Ashley Creek from ammonia toxicity impacts.

b) Project Description: The primary and secondary improvements include new pretreatment facilities (i. e., rag and grit removal), expansion of the secondary aeration system, chlorination, standby power, and inplant piping. Phosphorus removal facilities include a new flocculating clarifier; chemical storage, mixing, and metering equipment; and inplant piping to allow the flocculating clarifier to act as a backup secondary clarifier. Finally, ammonia reduction will be accomplished by expanding the secondary aeration to achieve nitrification of the wastewater to a level that would maintain the instream unionized ammonia concentration below 0.1 mg/l.

Major Cost Items:

a) Design Engineering . . . . . .$ 90,400.00
b) Construction Engineering . . . . . .unapproved at this time
c) Construction $1,460,000.00

Total Eligible Cost/EPA Share: $1,740,000.00/$1,305,000.00

WHITEFISH

Construction Grants:

-- A grant was made September 14, 1984 for $1,294,700. This was approximately 75% of the proposed project costs (see grant agreement fact sheet for proposed project description).

-- The financial analysis for the project costs was as follows:

	TOTAL PROJECT	PORTION ATTRIBUTED TO AWT
Capital Costs	$1,778,000	$727,000
Annual O & M	$67,000	$47,000
Annual Capital Costs and O & M	$110,400	$64,800
Number of Households	2,400	2,400
Annual Cost per Household	$62	$42
% Annual Household Income	0.4%	3%

*Excludes existing debt retirement and O & M--existing rates range from $5.50 to $9.63/mo for a minimum bill.

-- The design engineers are reluctant to proceed with the design of the facility due to unproven technology. A specific allowance was made in the grant to allow field testing of the technology prior to full scale design and construction. The community has agreed to proceed with the preliminary testing which should be completed by the end of March.

-- The City council and staff are very concerned about the high cost (O & M) of the chosen alternative.

Permits:

On December 5, 1984, Whitefish's MDPES permit MT-0020184 was renewed. The permit included final limits with a 1.0 mg/l total phosphorus effluent limitation. The permit required submittal of a compliance schedule by January 5, 1985. The city did not submit the required schedule. On January 16, 1985, the WQB sent Whitefish a certified letter, received on January 21, 1985, requiring compliance schedule submitted by February 21, 1985. No response to that letter has been received.

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
WATER QUALITY BUREAU

TED SCHWINDEN, GOVERNOR

Room A-206
COGSWELL BUILDING

STATE OF MONTANA

HELENA, MONTANA 59620
(406) 444-2406

GRANT AGREEMENT/AMENDMENT FACT SHEET

SUBJECT: Region VIII, Regional Administrator
Concurrence of New Grant

FROM: Department of Health and Environmental Sciences
Water Quality Bureau

TO: Project File

Grantee: Whitefish, Montana

Project Number: C300206-94

Project Step: Step 2+3

New Grant: $1,294,700.00

Summary Narrative:

a) Need: Supplements to the Whitefish Facility Plan investigated two wastewater treatment needs for the city of Whitefish. First, the city's main interceptor along the Whitefish River does not have sufficient capacity for wastewater and inflow generated in the city. Minor inflow reduction is cost-effective; however, the interceptor will continue to bypass raw sewage to the Whitefish River. Second, the state has determined that phosphorus is a limiting nutrient for algae growth in Flathead Lake. All upstream dischargers including Whitefish must meet an effluent phosphorus limit of 1.0 mg/l.

b) Project Description: The Whitefish River interceptor improvements include the replacement of 5,000 lineal feet of 15- and 18-inch sewer pipe with 18- to 30-inch sewer pipe, expanding the Columbia Avenue lift station and expanding the capacity of the force main. The phosphorus removal facilities at the existing aerated lagoons include chemical addition, mixing, flocculation and settling in the existing phased isolation ponds, and filtration. Field testing of the process to explore the possibility of an innovative technology determination is included.

Major Cost Items:

a) Design Engineering . . . . . .$ 141,750.00
b) Construction Engineering . . . . . .$ 78,000.00
c) Construction $1,440,850.00

Total Eligible Cost/EPA Share: $1,722,000.00/$1,294,700.00

COLUMBIA FALLS

Construction Grants:

-- Secondary treatment facility has been constructed and is in operation.

-- Community has requested increased grant assistance to construct AWT facilities. Estimated project cost is $390,000.

-- No financial analysis is available other than in WQB phosphorus strategy. Estimated cost per user is $2.50-$3.50/mo for phosphorus removal.

-- WQB is unable to fund increase to grant until additional funds become available. This should occur prior to end of FY 85 (October, 1985).

Permits:

On January 25, 1985, the Columbia Falls MPDES permit MT-0020036 was modified to include a final 1.0 mg/l total phosphorus limitation. The modified permit also required submittal of a compliance schedule setting forth dates where the total phosphorus limit would be attained. To date, a compliance schedule has not been received.

LAKESIDE

Construction Grants:

-- A grant was made August 21, 1984 for $2,385,600. This was approximately 78% of the proposed project costs (see grant agreement fact sheet for proposed project description).

-- The original project site was found to be unacceptable. Therefore, a new site and facility alternative analysis was required and completed.

-- The financial analysis of the revised project is as follows:

	TOTAL
Capital Costs	$4,920,000
Annual O & M Costs	$70,460
Annual Capital Costs and O & M	$585,690
Number of Households	450-650
Annual Cost per Household	$365-$253

-- The wastewater treatment facilities will remove phosphorus as a result of land treatment. No additional facilities are necessary.

Permits:

-- No permit.

-- Non-discharging facility.

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

WATER QUALITY BUREAU

Room A-206

TED SCHWINDEN, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

HELENA, MONTANA 59620

(406) 444-2406

GRANT AGREEMENT/AMENDMENT FACT SHEET

SUBJECT: Region VIII, Regional Administrator
Concurrence of New Grant

FROM: Department of Health and Environmental Sciences
Water Quality Bureau

TO: Project File

Grantee: Lakeside County Sewer District, Montana

Project Number: C300295-94

Project Step: Step 2+3

New Grant: $2,385,600.00

Summary Narrative:

a) Need: Lakeside is a small community of 1,538 residents located on the west shore of Flathead Lake. Wastewater treatment from individual onsite systems is inadequate which results in contamination of potable water wells, surfacing sewage, a public health hazard, and shore line algal blooms from nutrient loading. Onsite treatment systems are inappropriate for the Lakeside area due to the following limitations: 1) excessive soil permeability, 2) shallow bedrock or impermeable layers, 3) seasonal shallow groundwater, 4) slopes greater than 15 percent, and 5) drainfield inundation.

b) Project Description: The most cost-effective and environmentally sound alternative which was selected by the District included wastewater collection by conventional gravity sewers with several booster pump stations and one small pressure sewer area, treatment in aerated ponds, winter storage and disposal by summer spray irrigation. The system includes about 60,000 lineal feet of sewer lines, 10 pump stations, 6,000 lineal feet of force main, a two-cell aerated pond and a storage cell located on 6 acres and a 110-acre spray disposal site.

Major Cost Items:

a) Design Engineering. . . . . .$ 233,900.00
b) Construction Engineering. . . . . .$ 185,000.00
c) Construction. $2,591,400.00

Total Eligible Cost/EPA Share: $3,014,300.00/$2,385,600.00

Bureau of Reclamation:

Hungry Horse Dam:

Permits:

On October 23, 1984, MPDES permit MT-0022578 was renewed for the Hungry Horse Dam facility (discharge from package wastewater treatment plant). The permit had interim and final limits. Final limits included a 1.0 mg/l total phosphorus limitation. On January 8, 1985, the WQB received the following compliance schedule from the Bureau of Reclamation:

(a) Completion of design for modifications of present system--July 8, 1985.

(b) Equipment solicitations issued--August 1, 1985.

(c) Start of system modification and equipment installation--November 15, 1985.

(d) Attainment of complete operational status and compliance with standards--January 1, 1986.

Montana Association Of Conservation Districts

7 Edwards
Helena, Montana 59601
Ph. 406-443-5711

March 22, 1985

TO: The Honorable Dorothy Eck, Chairman
Senate Natural Resources Committee

TESTIMONY ON HOUSE JOINT RESOLUTION 20 COMMEMORATING 50 YEARS OF SOIL AND WATER CONSERVATION MOVEMENT IN MONTANA.

The Conservation Districts have a very close working relationship with the Soil Conservation Service on a local and state level. The Districts rely heavily on the Soil Conservation Service for their technical expertise, development and maintenance of sound soil and water conservation measures. The Soil Conservation Service not only benefits the agriculture community but all citizens of Montana.

In the present light of Soil Conservation Service budget cuts, we the Association feel there is a need to recognize the Soil Conservation Service work they have done in the past 50 years.

Dave Donaldson
Executive Vice President

DD:dv

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 43
DATE 032285
BILL NO. HJR20

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION
CONSERVATION DISTRICTS DIVISION

TED SCHWINDEN, GOVERNOR

32 SOUTH EWING

STATE OF MONTANA

(406) 444-6667

HELENA, MONTANA 59620

HJR 20

Madam Chairman, members of the committee, my name is Ray Beck, I represent the Department of Natural Resources and Conservation.

The Soil Conservation Service has provided valuable assistance and technical expertise to Montana since they were established 50 years ago. This is one federal agency that has had very few confrontations with citizens of this state. Almost everyone that has worked with or received assistance from SCS will state that they were very professional and helpful with their assistance.

We work with the Soil Conservation Service on a daily, and, many times, on a hourly basis. We feel that they definitely deserve this recognition through House Joint Resolution #20.

I would like to urge this Committee's support for HJR 20.

Thank you.

Ray Beck

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 42
DATE 032285
BILL NO. HJR20

MONTANA
FARM BUREAU
FEDERATION

502 South 19th Bozeman, Montana 59715
Phone (406) 587-3153

TESTIMONY BY: Alan Eck

BILL # HJR-20 DATE 3/22/85

SUPPORT XXX OPPOSE

Mr. Chairman and members of the committee, I'm Alan Eck representing the Montana Farm Bureau Federation. We would like to go on record as strongly supporting HJR-20. Thank you.

Alan Eck
SIGNED

SENATE NATURAL RESOURCES CO
EXHIBIT NO. 44
DATE 032285
BILL NO. HJR20

MONTANA
FARM BUREAU
FEDERATION

502 South 19th Bozeman, Montana 59715
Phone (406) 587-3153

TESTIMONY BY: Alan Eck

BILL # HJR-25 DATE 3/22/85

SUPPORT XXX OPPOSE

Mr. Chairman and members of the committee, for the record my name is Alan Eck . I'm representing the Montana FArm Bureau Federation. The Farm Bureau strongly supports HJR-25. We feel that it expresses our long standing policy supporting multiple use management of ~~xxx~~ our resources. Thank You.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 45
DATE 032285
BILL NO. HJR25

Alan Eck
SIGNED

HJR27

Approximate Latitudes of Select Montana Cities

Bozeman - 45°
Billings - 45°
Butte - 45°
Great Falls - 47°
Havre - 48°
Helena - 46°
Kalispell - 48°
Miles City - 46°
Missoula - 46°

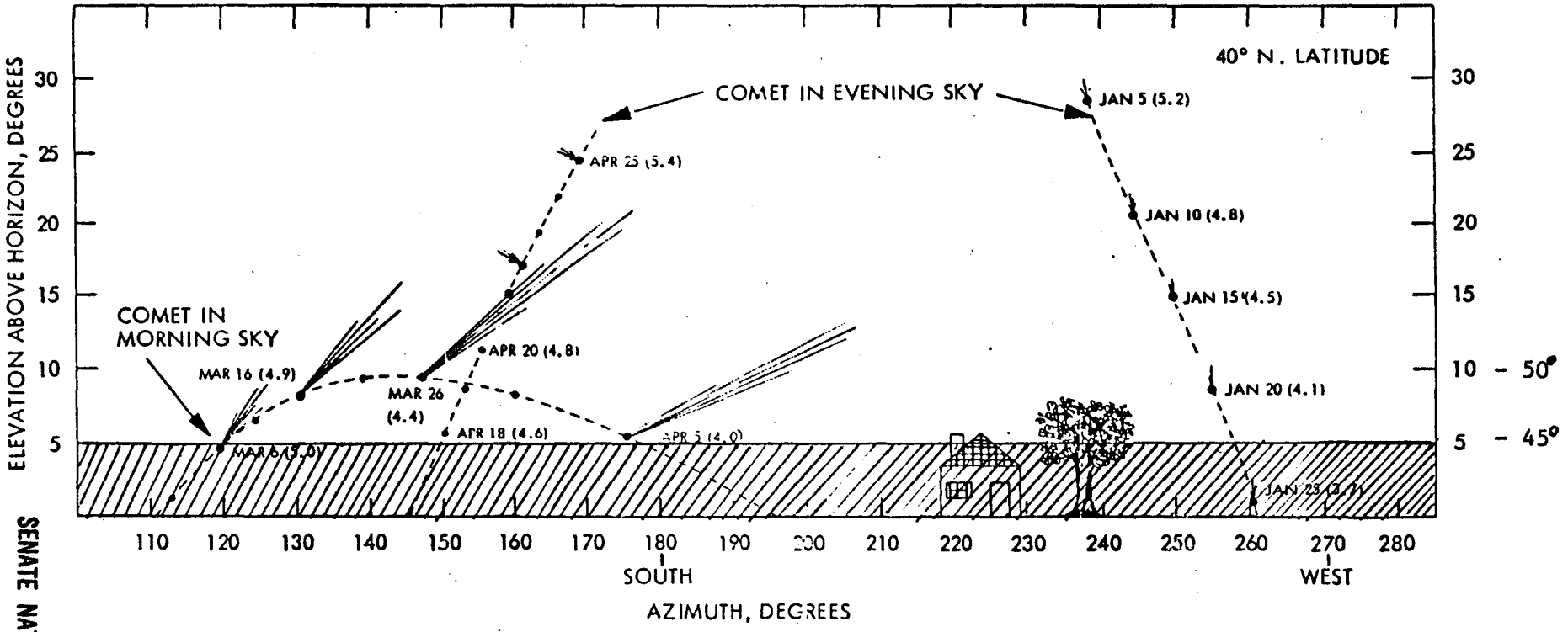


Fig. 9. Comet Halley Observing Conditions in 1986 for Observers Located at 40° North Latitude. Comet Positions are Given for Beginning of Morning Astronomical Twilight or End of Evening Astronomical Twilight. Approximate Total Visual Magnitudes are Given in Parentheses Following Dates. Viewing with Binoculars and Ideal Observing Conditions are Assumed.

Striped line indicates the horizon in Montana (starting at 45°). Adjust map for various cities by estimating the horizon as the Latitude of that city.

Halley's Comet will be higher in the sky in November. It will not have much of a tail at this time but it will be higher in the sky in the Northern Hemisphere.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 16
DATE 032285
BILL NO. HJR27

MADAME CHAIRMAN AND MEMBERS OF THE COMMITTEE:

For the record, my name is Jill Rohyans, Vice President of the Helena Astronomical Society. Even though viewing of Halley's Comet will be marginal, at best, in Montana, we certainly wholeheartedly support the bill.

Actually, the most important part of the bill is the part that causes most people to grin when they read the bill. Light pollution is the bane of all astronomers, amateur and professional. Palomar Observatory is experiencing serious light pollution problems and the work being done there is in jeopardy. Elaborate plans are being formulated with cities in the area for dimming of lights in order to preserve some quality night viewing.

Halley's Comet will be so dim, with only the tail portion visible in Montana, that we "need all the help we can get".

If you want to see a graphic demonstration, please feel free to attend a public viewing by the Helena Astronomical Society Saturday night, March 23, 7:30 p.m. at Rossiter School in the Helena Valley. Members of the Society will be there with a variety of telescopes as well as some beautiful planets, nebulae, and galaxies for your viewing pleasure.

One note - look up and see if you can see the stars before you leave home, (no, telescopes can't see through clouds), and dress very very warmly.

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 47
DATE 032285
BILL NO. HJR27

HALLEY'S COMET: A SPACE SPECTACULAR

The New Year 1985 will see the start of a space spectacular destined to be the most widely observed celestial event in human history.

Last seen by the naked eye as it sped away from the Earth more than seven decades ago, Halley's Comet is now racing from beyond the Planet Pluto toward its 76-year reunion with the Earth.

Few events in the heavens can rival this apparition (last seen in the skies above the Earth in 1910) which bears the name of the 18th century British astronomer Sir Edmond Halley. It was Halley who first chronicled that the comets that had appeared in 1531, 1607 and 1682 behaved in the same way and must therefore be the same comet returning in a cycle of 76 years.

By the time the comet fades from sight as it speeds away from the Earth in late May of 1986, hundreds of millions of the world's populace will have seen it with the naked eye or–better–with telescopes and binoculars! This trip, Halley will have been watched, measured, pictured and analyzed millions of times by most of the world's professional astronomers and thousands on thousands of its amateurs.

Why?

Simply stated, there is nothing in the heavens like a comet. It was first reported seen in 240 B.C. and has been linked with some of the most awesome and important events in earth's brief history. It is a

Continued on page 2

UPDATE...COMET WATCH UPDATE...COMET

SPACE SPECTACULAR

(cont'd from p. 1)

celestial historian, whose 76 year orbit so parallels the passage of one human life span that it reminds us all of the passing of another marker of time and the start of a new age.

Among the millions, perhaps billions, of comets there is nothing that captures the imagination like Halley.

Halley swarms with exotic dust particles and complex molecules of sodium, carbon, oxygen, nitrogen and hydrogen that have been part of it since the dawn of time. Perhaps in this molecular DNA of Halley's Comet we will discover clues to our own existence.

"I know of no other astronomical effort even comparable to the gathering interest in Halley," said the Jet Propulsion Laboratory's Ray Newburn, Jr.

Besides the extensive ground-based efforts the study will include close-in measurements and photographs to be made by five spacecraft–one from the European Space Agency, two from Japan and two from the Soviet Union. The U.S. will use an existing satellite and the Space Telescope in its efforts to gather data on Halley.

The comet will best be seen from earth on April 11, 1986. On April 24th the world will be treated to an even more wondrous sight. On that night Halley's Comet will be visible in the same region of the sky as the full moon which will be undergoing a total eclipse by the Earth.

But in all these scientific details, perhaps nothing better captures the fascination man has always had with this comet's passing than a comment by William Safire in a recent *New York Times* article headed: "Halley's Sure Thing": "Some things can be depended upon. Uncertainty may be our lot and doubt may be our state, but the reassuring regularity of Halley's Comet justifies hope."

UPDATE...COMET WATCH UPDATE...COMET

COMET STAMP PROPOSED

Halley's Comet Watch '86 has proposed to the U.S. Postal Service that a Christmas stamp be issued to commemorate the 1985-86 return of Halley's Comet, suggesting Giotto di Bondone's masterpiece, *The Adoration of the Magi*, (pictured at right), which depicts the 1301 return of Halley's Comet, be used.

Your support for the "Giotto Christmas Stamp" will help. Please write your congressional representative or the Citizen's Stamp Advisory Committee, c/o Stamps Division, U.S. Postal Service, Washington, DC. 20260.

WHAT IS A COMET?

Comets have been taken as portents of doom since 467 B.C. when the Chinese recorded the first one streaking across the sky. Halley's comet, history's most famous, was thought to have foretold the destruction of Jerusalem when it appeared in A.D. 66, the Norman conquest of Britain in 1066 and the fall of Constantinople to the Turks in 1456. Today comets inspire considerably more fascination than fear.

Astronomers discover about four new comets a year, but scientists know less

Continued on page

UPDATE...COMET WATCH UPDATE...COMET

WHAT IS A COMET? (cont'd from p. 5)

about the interior of a comet than about the inside of an atom. For 30 years the accepted theory has been that they are clumps of dust and frozen gas that Neptune and Uranus pushed out to the deep freeze of outer space; they visit Earth when a passing star knocks them out of hibernation.

Some stray so much from their predicted orbits that they return to Earth days later than expected–an eternity in the precise science of orbital mechanics. Halley's comet changes its 76-year orbit by up to four days.

COMET CALENDAR

1985 NOV. First close approach; visible all night through binoculars/small telescopes.
1985 DEC. First naked-eye sighting, in evening.
1986 JAN. 1-20. Naked-eye in dark skies; early evening.
1986 FEB. 9. Perihelion (comet disappears behind sun).
1986 FEB. 20-MAR. 15. Reappears before dawn, naked-eye with rapidly lengthening tail.
1986 MAR. 15-25. Best for those above lat. 35° N., in SE for a few hours pre-dawn; tail near longest.
1986 APR. 10-11. Closest approach to earth, but also farthest south.
1986 APR. 12-26. Comes rapidly north; shortening tail and dimming, but visible for much of night; moon becomes problem.
1986 APR. 26-MAY 4. Last naked-eye view; visible much of night.
1986 MAY-AUG. Seen in small telescopes until lost in sun's glare.

UPDATE...COMET WATCH UPDATE...COMET

From the PHILADELPHIA INQUIRER
September 15, 1984

Too much light

To the Editor:

Before William Penn founded this city, men were staring into the night sky observing the wonders of the heavens. Today, many people in this city continue to enjoy astronomy. However, the dark, beautiful skies of the past have gradually been getting brighter and brighter in Philadelphia and most other cities.

The many high-voltage street lights and other sources of light combine to form light pollution. This light pollution acts like smog as it blocks out many stars, most meteors and the beautiful tails of comets. To see these things, a person must travel far away from this city.

It is a shame that in 1986, when Halley's Comet returns, interested people will have to travel far from the light-polluted city to get a view of this beautiful object. I think that if the city reduces the brightness of street lights and removes unnecessary lighting it will give us all a better view of the night sky. It will also save money on energy costs.

RONALD KAUFMANN
Philadelphia.

Senate Natural Resources Committee
March 22, 1985

Testimony on House Joint Resolution 27

Madame Chair + Members of the Committee

My name is Betsy Spettigue. Today, I am representing Dr. Gerald Wheeler in support of House Joint Resolution 27. Dr. Wheeler has been the Director of the Science-Math Resource Center at Montana State University for the past 10 years. The Resource Center's main purpose is providing "science for the public", especially to the young. The appearance of Halley's Comet affords the Resource Center a unique educational opportunity. This event can be shared with Montanans, young and old alike, statewide. But we need your help ... to encourage all Montanans to dim or extinguish non-essential outdoor lighting during the times Halley's will be visible in Montana's skies. The Resource Center can help publicize these times through their newsletter to 1,200 science and math public school teachers reaching 30,000 students and on the Center's weekly television program on Astronomy.

I hope you concur and give House Joint Resolution 27 a "do pass" Thank you.

I would just like to add, that as a private citizen, I too am interested in the best possible viewing opportunities of Halley's Comet in my lifetime and urge you to support House Joint Resolution 27. Thanks!

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 48
DATE 032285
BILL NO. HJR27

Montana State University
Bozeman, Montana 59717-0001

Science/Math Resource Center

Telephone (406) 994-3580

8 March 1985

Senate Education & Cultural Resources Committee

Dear Sirs:

We strongly support the proposed resolution to dim our Montana lights so that our citizens may see Halley's Comet.

The Science/Math Resource Center is a basic source of information for all science and math public school teachers in Montana. With the passage of this bill, we will be able to help over 30,000 youngsters experience this once-in-a-lifetime event.

Sincerely,

Gerald F. Wheeler

Dr. Gerald Wheeler
Director of the Science/Math
Resource Center

SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 49
DATE 032285
BILL NO. HJR27

Montana State University
Bozeman, Montana 59717

Department of Physics
College of Letters and Science

Telephone (406) 994-3614

TO: Senate Education and Cultural Resources Committee
FROM: Georgeanne R. Caughlan, Professor Emeritus
RE: House Joint Resolution 27
DATE: March 6, 1985

Georgeanne R. Caughlan

I strongly support HJR 27 asking for a decrease in light pollution during the visit of Halley's comet.

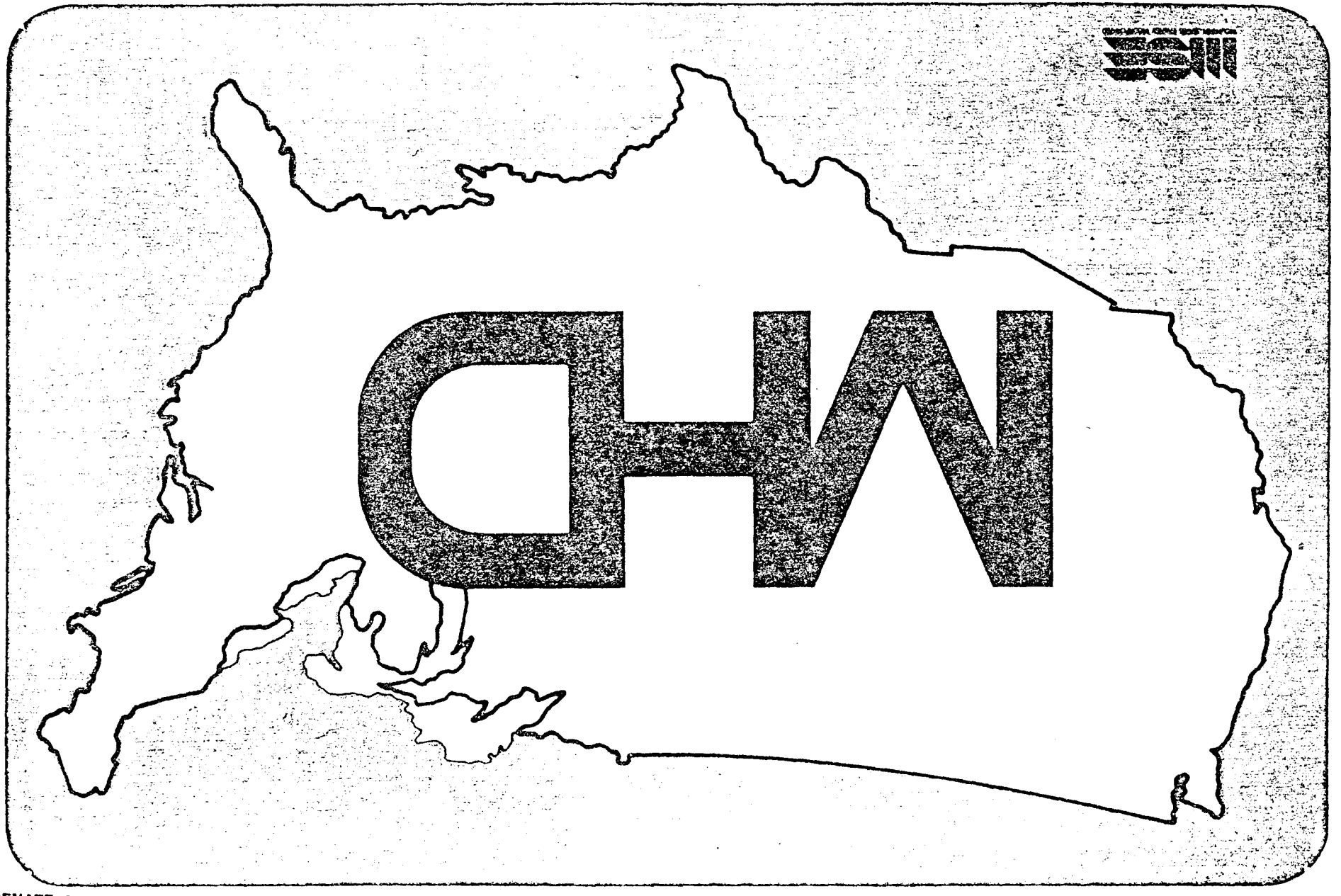
The physics department at MSU plans on having some public observing sessions when we can determine that a good view of the comet in binoculars or our 8" telescopes will be possible.

It will be important to have dark skies to observe the faint object well above our southwest horizon in the evenings as it approaches the Sun from November 1985 to January 1986. After its February perihelion passage, it will be a brighter object with a greater tail as it recedes from the Sun and will be visible in March and April 1986 in the south to southeast shortly before morning twilight; however, for observers at our 45° 43' N latitude, it will be quite close to the horizon, and light pollution will make it extremely difficult to observe.

We hope the Bozeman City Commission and the University Administration will heed the plea to reduce light pollution to a minimum in the town and on the campus so we can enjoy this once in a lifetime visit of Halley.

cc: R. J. Swenson
W. J. Tietz
E. D. Rice
K. L. Weaver

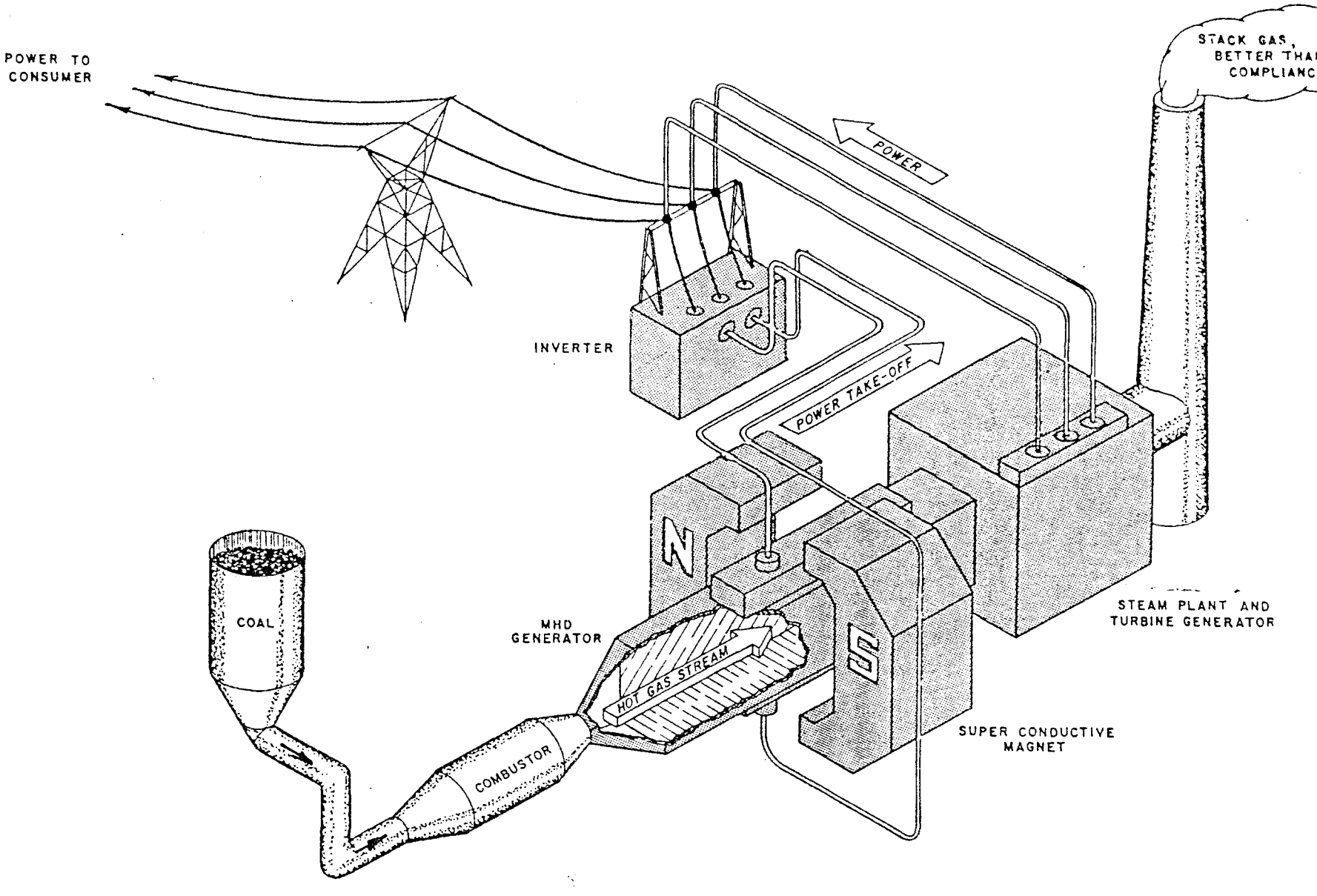
SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 50
DATE 032285
BILL NO HJR27



SENATE NATURAL RESOURCES COMMITTEE
EXHIBIT NO. 51
DATE 032285
BILL NO. HJR 35

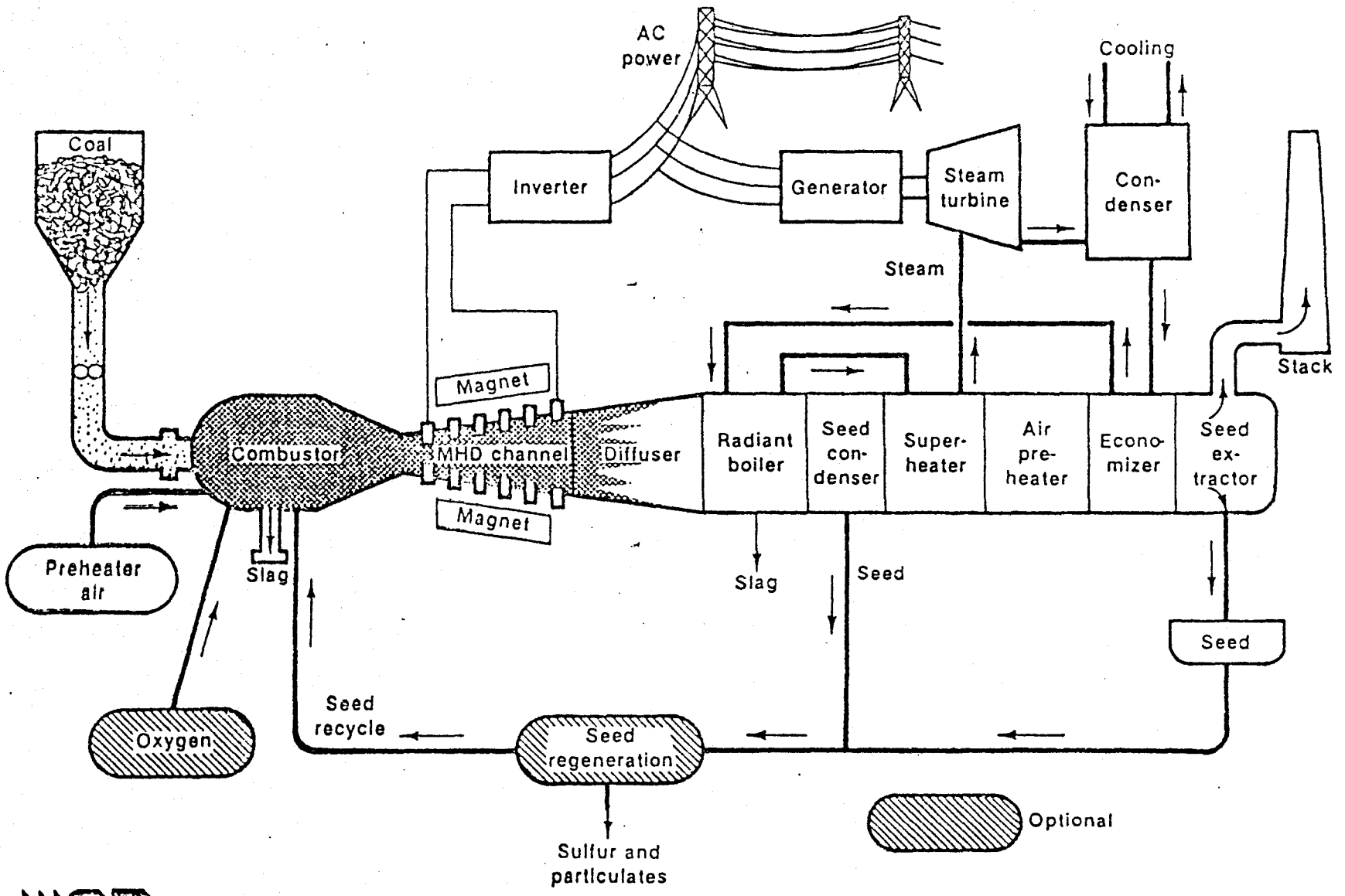
COAL FIRED MHD SYSTEMS

- DIRECT COAL COMBUSTION (EASTERN AND WESTERN COALS)
- LOW ENVIRONMENTAL INTRUSION POTENTIAL
  - 99% SO_x REMOVAL
  - NO_x REDUCTION TO 0.1 LB/MBTU
  - VERY LOW SOLID/LIQUID WASTE
  - REDUCED CO_2 EMISSIONS
- HIGH EFFICIENCY POTENTIAL
  - 55% NET PLANT EFFICIENCIES IN MATURE SYSTEMS
  - 45% NET PLANT EFFICIENCIES IN EARLY COMMERCIAL SYSTEMS
- LOW COST-OF-ELECTRICITY POTENTIAL
- REASONABLE DEVELOPMENT RISK
- GOOD ENGINEERING PROGRESS
- DEPLOYABLE BY THE EARLY 1990s OR EARLIER
- UTILITY/INDUSTRIAL INTEREST AND PARTICIPATION



DWN: N. JASMINE 3-21-81

MHD - POWER PLANT


AC power
Cooling
Coal
Inverter
Generator
Steam turbine
Con-denser
Steam
Stack
Magnet
Combustor
MHD channel
Diffuser
Radiant boiler
Seed con-denser
Super-heater
Air pre-heater
Econo-mizer
Seed ex-tractor
Magnet
Preheater air
Slag
Slag
Seed
Seed
Seed recycle
Oxygen
Seed regeneration
Optional
Sulfur and particulates

STATE OF MONTANA

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION (DNRC)

ENGINEERING ASSESSMENT OF AN MHD ADVANCED TEST SYSTEM

DNRC

- TWO PHASE PROPOSAL WRITTEN JOINTLY WITH MPC

- PHASE I - MPC DEFINED PRECOMMERCIAL SCALE PLANT REQUIREMENTS

- PHASE II - MSE DEVELOP F&OR AND CONCEPTUAL DESIGN

- IMPACT ON NATIONAL PROGRAM AND MONTANA

DOE MHD PROGRAM SUMMARY

MEET WITH MHD INDUSTRIAL COMMUNITY AND UTILITIES FOR MAXIMUM UNDERSTANDING

FORMULATE PROOF-OF-CONCEPT (POC) TESTING ROLES

TOPPING CYCLE POC AT CDIF

BOTTOMING CYCLE POC AT CFFF

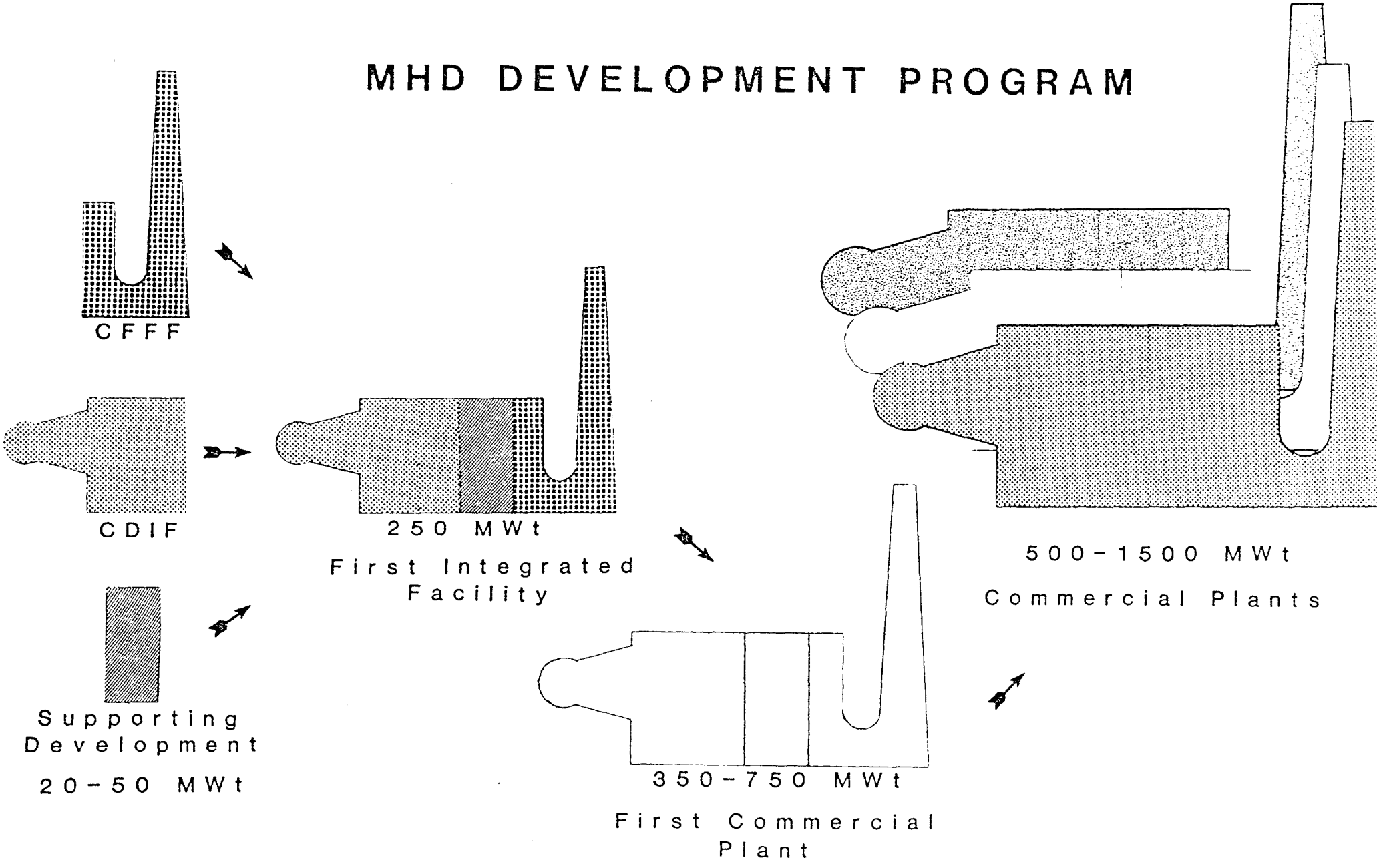
SEED REGENERATION POC AT (TO BE DETERMINED)

NATIONAL MHD PROGRAM OBJECTIVES

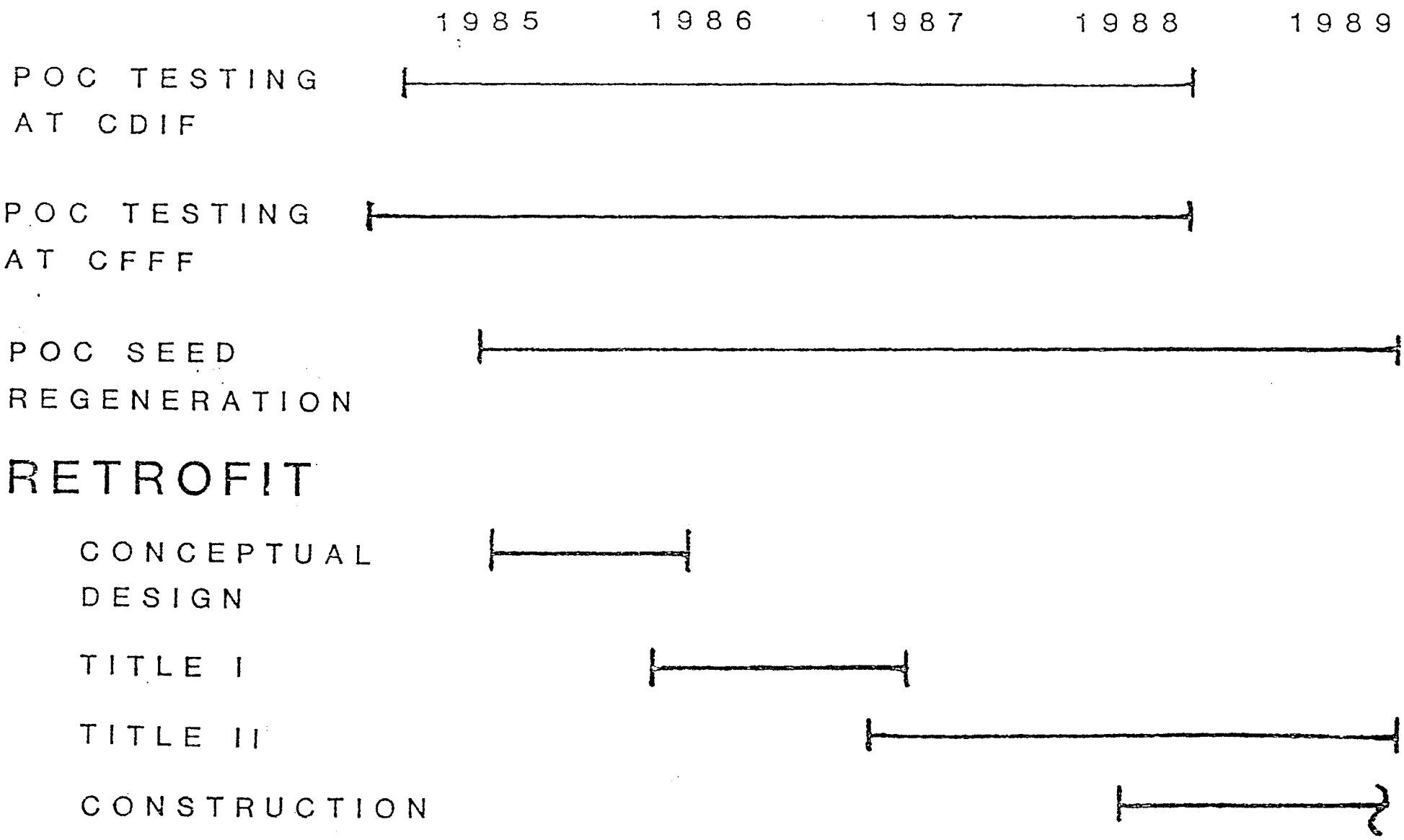
INSTITUTE A MULTIYEAR PROGRAM
THAT HAS AS ITS FOCAL POINT
-- THE MHD RETROFIT OF AN
EXISTING POWER PLANT.

REQUEST ADEQUATE FUNDING
FOR SUCH A PROGRAM

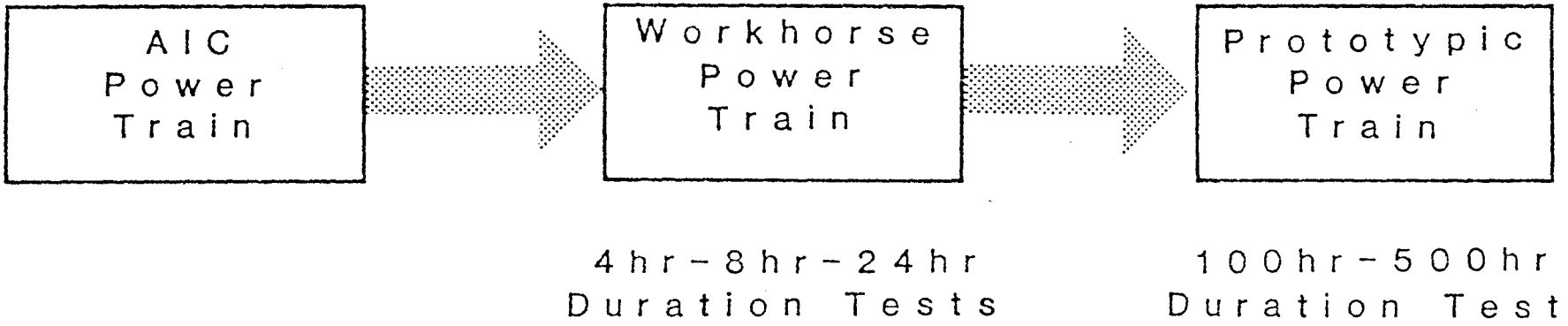
MHD DEVELOPMENT PROGRAM



ESTIMATED MHD PROGRAM TIMETABLE



CDIF MHD PROGRAM



STANDING COMMITTEE REPORT

MARCH 22 19 85

MR. PRESIDENT

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE JOINT RESOLUTION No. 19

THIRD (FULLER) reading copy (BLUE color)

TO AUTHORIZE MEMORIAL TABLET IN MITCHELL BUILDING

Respectfully report as follows: That HOUSE JOINT RESOLUTION No. 19

BE CONCURRED IN

~~DO PASS~~

~~BE INDEFINITELY POSTPONED~~

SENATOR DOROTHY ECK Chairman.

STANDING COMMITTEE REPORT

MARCH 22 19 95

MR. PRESIDENT

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE JOINT RESOLUTION No. 20

THIRD (WEEDING) reading copy (BLUE color)

RESOLUTION COMMENDING SOIL CONSERVATION SERVICE

Respectfully report as follows: That HOUSE JOINT RESOLUTION No. 20

BE CONCURRED IN

~~XXXXXX~~

~~XXXXXXXXX~~

SENATOR DOROTHY ECK Chairman.