UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: July 9, 1979

SUBJECT: Region VIII Integrated Toxic Strategy

FROM: 8AH-TS

TO: See Below

This Region has developed a Regional Integrated Toxic Strategy which is attached. I would like to point out two items which I think are significant in terms of the Strategy. First, we have a Toxics Integration Committee made up of the Division Directors and appropriate office personnel with myself as executive director. Issues related to toxics needing policy direction or policy approval are forwarded through this Committee to the Regional Administrator. Resource issues involving the Divisions are handled promptly through the Committee. Secondly, the Strategy is further supported by the restructuring of the Branch. As noted from the attached Branch organizational chart, we have organized the Branch in a manner to give maximum support to both toxics and pesticide issues.

Our Integrated Strategy has been evolving for several months. Currently, the staff is developing work plans for the priority toxic chemicals and industry categories. Both the States and the Interagency Regulatory Liaison Group (IRLG) have provided input to the approach we are using. In fact, the State/EPA Agreements include an item related to the development of Integrated Toxic Strategies at the State level.

We would appreciate your comments on our Strategy. In addition, we would like to acquire a copy of Toxic Strategies for the other Regions. If you have any questions on this package please contact either Dean Gillam or myself at FTS 327-3926, (303) 837-3926.

Louis W. Johnson, Chief
Toxic Substances Branch
Environmental Protection Agency

Attachments

Addressees:
Murray Newton
Regional Branch Chiefs
Toxic Coordinators

REGION VIII INTEGRATED TOXICS STRATEGY

CC: Al Smith 8E-E

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: March 13, 1979

SUBJECT: Region VIII Integrated Toxics Strategy

FROM: 8AH-P

TO: All Division Directors
OPAIR
ORC

Attached is a summary of the activities of the Region VIII Toxics Integration Committee to date. The Committee has selected what it considers to be the highest priority chemicals and industries in the Region for development of individual Work Plans within the Integrated Toxics Strategy. The chemicals selected were grouped into first and second priority levels. Asbestos, PCB's and cadmium were selected as first priority, while lead, mercury and arsenic were second priority chemicals. Regarding industries, the Committee felt that federal facilities were the most important "industry" for development of a Work Plan. Next in importance were smelters and power plants, followed by chemical plants and refineries.

Please ponder the above selections of the Committee, peruse the attached sheets which characterize each chemical, and determine those chemicals and industries to which you would feel best about committing resources in fulfillment of the Integrated Toxics Strategy. If your priorities are different than those noted above, please develop your rationale. They are not unchangeable. A meeting of the Division and Office Directors will be held on Monday, March 26, at 10 a.m. in the Elm Room. At this time we will discuss the recommendations which will go forward to the RA and DRA as to the chemicals and industries for which we will develop Work Plans within the Integrated Toxics Strategy. It is important that you attend rather than your Committee designate so that Division priorities and resources can be reflected in the development of the package.

Dave

David A. Wagoner, Director
Air and Hazardous Materials Division

Attachment

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REGION VIII INTEGRATED TOXICS STRATEGY

I. EXECUTIVE SUMMARY

EPA Region VIII developed an Integrated Toxics Strategy to improve coordination between all of the environmental media programs (air, water, solid waste, and toxics) to address situations that impact more than one media. Development and implementation of the Region VIII Integrated Toxics Strategy occurs through a Toxics Integration Committee. The principal function of the Committee is to coordinate Regional strategy and allocate resources for dealing with high priority multi-media toxics problems.

The Toxics Integration Committee held a series of meetings in FY-79 to determine which chemicals and industries should be addressed under the Integrated Toxics Strategy. A format was developed by the Committee that defined the criteria for prioritizing a chemical. This format was used for the characterization of the eleven chemicals selected for preliminary study. The Committee also asked each of the six states, IRLG agencies and NIOSH for their input as to what chemicals and industries they felt were of multi-media concern and which most deserved to be addressed by the Committee. A map which showed excessive cancer rates for each county in the Region was overlayed with maps of various industries. This map was used to determine if any correlations could be made between excessive cancer rates in a given area and the industries located in that area.

After assessing all of the information provided, the Committee selected what it considered to be the six highest priority chemicals (PCB's, asbestos, cadmium, lead, mercury and arsenic) and the three highest priority industries (federal facilities, smelters and power plants) in Region VIII for the development of individual Work Plans. A Work Plan addresses the health and environmental problems caused by a particular chemical or industry and outlines Regional and state activities, resources, public awareness programs, etc., to implement the corrective actions needed for that specific toxics priority. As other high priority toxic pollutants surface, they will be reviewed and prioritized among the existing toxics problems.

The Integrated Toxics Strategy also addresses the coordination of toxic problems with each of the states in Region VIII. It is desirable that an organizational body be designated within each state to correspond with the Region VIII Toxics Integration Committee. This will enhance communications between EPA and the states. Also, when necessary, state resources will be mobilized as part of the individual Work Plans.

Finally, semi-annual progress reports and annual reports will be developed by the Committee.

II. BACKGROUND

A. Rationale

Each EPA media program has its own unique problems which involve the control of toxic substances. However, control alternatives often impact on one or more of the other environmental media. Likewise, some toxics problems are common to several of the media and need a multi-media approach for their solution. Thus, it was necessary to devise the proper forum within EPA Region VIII which would maximize cooperation between the media in these matters. The Region has chosen to make this a high priority effort and will commit the resources necessary to carry out this task.

B. Toxics Integration Committee

While nearly every pollutant regulated by EPA might be construed as a toxic substance, it is not the intent of this Regional Office to control all of these parameters through the integrated toxics control forum. Only those toxic substances whose control cannot be effected by a single media will be addressed by the integrated regional approach.

The Region VIII Toxics Integration Committee has the responsibility for implementation of the Integrated Toxics Strategy. The Committee is a policy-recommending group whose membership is made up as follows:

Chairperson: Division Director, A&HM Division
Executive Director: Chief, Toxic Substances Branch, A&HM Division
Members: Director, Water Division
Director, Enforcement Division
Director, Surveillance & Analysis Division
Director, OPAIR
Director, Montana Office
Director, Management Division

The principal functions of this group will be to coordinate Regional strategy and resources and to develop policy for dealing with toxic substances problems which are multi-media in nature. Examples of policy issues which might be addressed by the Committee are: emergency response coordination, Federal/State liaison, toxic problem assessment, information system coordination, monitoring, and public participation.

The Committee has designated six chemicals and three industries for development of individual Work Plans within the Integrated Toxics Strategy. The chemicals selected were grouped into first and second priority levels. Asbestos, PCB's and cadmium were selected as first priority, with lead, mercury and arsenic designated as second priority chemicals. Likewise, the Committee selected Federal facilities as the most important "industry" to be addressed in Region VIII followed by smelters, and power plants.

As other toxics problems surface, the Toxics Integration Committee will address them based on the criteria considered in characterizing the above-mentioned chemicals and industries and will assign the new problem a priority.

C. Prioritizing Chemicals for Strategy Development

The first meeting of the Toxics Integration Committee was held on November 17, 1978. The principal purpose of the meeting was to review an outline which had been prepared by the staff of the Toxic Substances Branch for the Integrated Toxics Strategy. In addition, the objectives and goals of the Committee were outlined to the participants. Each Committee member designated a Division or Staff Office representative. The Toxics Strategies of Regions IV and X were reviewed for format and content.

There are two general criteria for choosing chemicals to be studied: (1) release into the environment through more than one media; and (2) control mechanisms requiring the efforts of more than one media program. Chemicals which are currently regulated but which are not being properly controlled in the environment can also be included.

The second meeting of the Committee was held on January 12, 1979. The purpose of the meeting was to receive suggestions from each representative as to the chemicals they thought might be considered under an Integrated Toxics Strategy. Each suggestion was discussed and the list was narrowed down to those chemicals presenting the greatest hazard. Those chemicals with the most potential for harm were to be characterized by the staff of the Executive Director as to their real health and environmental impact so that the Committee could then further narrow the list to those of highest priority. The committee would then develop specific Work Plans for the highest priority chemicals. The initial list of chemicals suggested by the various representatives included the following:

aldrin
ammonia
arsenic
asbestos
benzene
beryllium
cadmium
carbon tetrachloride
chlorinated hydrocarbons
chlorine
chlorobenzene
chlorofluro-carbons (CFC's)
electric utility wastes
electroplating wastes
heavy metals
hydrogen sulfide
lead
mercury
molybdenum
nitrates/nitrites
parathion
petroleum refinery waste products
polybrominated biphenyls (PBB's)
polychlorinated biphenyls (PCB's)
radionuclides
radium
sodium hydroxide
sulfuric acid mist
tetraethyl lead
trichlorethylene
trihalomethanes
toluene
vinyl chloride
1080

After discussion of each of the above-listed chemicals the Committee, voted on those chemicals which they felt deserved further study. The following are those chemicals which the Committee chose to characterize:

ammonia
arsenic
asbestos
benzene
cadmium
chlorinated hydrocarbons (generic)
heavy metals(generic)
lead
mercury
nitrates/nitrites (generic)
polychlorinated biphenyls
radionuclides (generic)

The staff of the Executive Director characterized each of the chemicals selected. Approximately three weeks were spent in this effort.

On January 19, 1979, a meeting was held with the Committee to explain the more important chemicals within the generic groups of chemicals noted above. Preliminary research of heavy metals showed that only lead, arsenic, cadmium, mercury, molybdenum, vanadium and zinc were worthy of further study on the basis of their toxicity and prevalence in Region VIII:

Arsenic - carcinogen found in pesticide products, copper smelters, power plants, mines

Cadmium - suspected carcinogen; extremely toxic to man and aquatic life; found in copper smilting, coal-fired power plants, internal combustion engines; refined at ASARCO Plant in Denver; mined within the Region

Lead - carcinogen; highly toxic to man and animals; emitted from internal combustion engines, flue gas, smelters; found in printing establishments, paint; being studied by the IRLG

Mercury - toxic to man and animals; found in flue gases

Molybdenum - toxic to farm livestock; mined in Region at a minimum of three different sites in large quantity

Vanadium - toxic to man; found in flue gas; present with uranium milling

Zinc - toxic to aquatic life; mined within the Region

The other heavy metals which were considered are listed in Appendix A, along with the reason(s) for their rejection from further study.

Initial review of the radionuclide group, namely uranium, radium, and thorium, indicated that on-going research through the Nuclear Regulatory Commission, Department of Energy, and Environmental Protection Agency (Solid Waste, Radiation, Hazardous Waste programs; and Office of Research & Development) was adequately addressing the problems and no further need for study on the part of the Toxics Integration Committee existed. However, the Committee decided that further research should be undertaken on the radionuclide group to be sure that enough was being done. The Waste Management Branch, Air and Hazardous Materials Division was assigned the task to further characterize the radionuclide group so that the Committee could get a better idea as to the need for including those chemicals in the Integrated Toxics Strategy.

These results will be added at a later date.

Cursory research done on nitrates and nitrites indicated that since the problem is primarily a water pollution problem, this group of chemicals is not really under the purview of the Committee. However, the Committee again requested further research into pollution caused by nitrates and nitrites so that it could have all the facts before making a decision whether or not to delete these chemicals from consideration. The task was assigned to the Control Technology Branch, Water Division. Upon completion of the assignment, the results were presented to the Committee. The Committee concluded that the impact of nitrates and nitrites was generally only a single-media problem and therefore should be deleted from the Integrated Toxics Strategy.

The generic group of chlorinated hydrocarbons was also examined and it was found that there are very few, if any, manufacturing sources within Region VIII. Thus, the presence of this chemical group within the Region will be primarily as a result of use. Pollution will largely result from many small direct and indirect sources rather than from a few large point sources and thus will be extremely difficult to monitor. Therefore, it was recommended that chlorinated hydrocarbons not be included in the Toxics Strategy. The Committee concurred and this group of chemicals was deleted from further consideration.

A format was presented to the Committee for characterizing each of the chemicals selected for preliminary study. It attempted to characterize the chemical by defining the most important parameters to consider when prioritizing a chemical in order to develop a Work Plan within the Integrated Toxics Strategy. The parameters selected were:

Specific sources; geography and magnitude of the sources
Population-at-risk or environmental exposure
Health and environmental hazards
Mode of entry into environment
Control mechanisms available
Current EPA and other agency efforts

In conclusion, eleven chemicals were chosen to be researched and characterized by the Executive Director's staff according to the format prescribed above. They were:

Ammonia	Lead
Asbestos	Mercury
Benzene	Molybdenum
PCB's	Vanadium
Arsenic	Zinc
Cadmium	

Two agencies which are heavily involved in chemicals and their impact on human health (OSHA and NIOSH) were contacted to derive from them those industries and chemicals which they felt were of most importance in terms of environmental contamination. Their concerns were: carbon monoxide, mercury, asbestos, coal tar pitch (found in the aluminum refineries and insulation industries), lead (from smelting operations), silica, organic solvents and vapors (generated from ski manufacturing, foaming, insultation, pesticide manufacturers, newspapers and printers). Foundries and coking plants were also considered environmental problems.

In addition, a letter was also sent to each of the six states along with the IRLG agencies within the Region asking them to review the list of chemicals and to request any additions, deletions or corrections that they thought were necessary. Appendix B is a summary of the comments made by each state and the IRLG agencies.

A meeting was held on January 26, 1979, wherein names of staff members characterizing each of the chemicals selected for study were given to the Committee. The Committee members were asked to pass any information which they regarded as important about a given chemical to the staff member researching the chemical, so that it could be properly reflected in the characterization of the chemical.

Finally, a list of industries which were worthy of study was requested from the Committee members. The industries suggested by the group were: fossil-fuel power plants, smelters, oil shale operations, petroleum refineries, mines, chemical plants, federal installations, sewage treatment plants, steel mills, and uranium mills.

Meetings were held on February 22 and 26, 1979. At these meetings the staff of the Committee reported their findings on the eleven chemicals chosen for preliminary study. Appendix C contains the charts and narratives characterizing each of the eleven chemicals which were studied showing sources, health hazards, population-at-risk, etc. On the basis of the information provided in these charts and a written narrative, along with Committee discussion, decisions were made as to which chemicals should be considered for the development of a Work Plan within the Integrated Toxics Strategy. Of the eleven chemicals studied, zinc, ammonia, benzene, vanadium, and molybdenum were deleted from further consideration primarily on the basis of their lack of demonstrated low-level chronic health/environmental effects; or that their entry into the environment is primarily through only one media; and/or the relative magnitude of the problems created by the chemical is less than the others considered.

The remaining chemicals were grouped into two categories of priority for development of Work Plans within the Integrated Toxics Strategy. The highest priority chemicals are asbestos, PCB's and cadmium. Second priority chemicals are arsenic, lead and mercury. A vote was taken to decide which industries should be characterized by Work Plans in the Strategy. Federal Facilities seemed to be of the highest priority, followed by smelters and power plants. These were followed by chemical plants and refineries. The time table for completion of these Work Plans is on the following page.

TIMETABLE FOR DEVELOPMENT OF WORK PLANS FOR SPECIFIC CHEMICAL AND INDUSTRIES UNDER THE INTEGRATED TOXICS STRATEGY

			Calendar					
	Likely	Date Complete	April	May	June	July	Aug.	Sept.
1st Chemical	PCBs	4-23-79	23					
2nd Chemical	Asbestos	5-21-79		21				
3rd Chemical	Cadmium	6-18-79			18			
4th Chemical	Lead	7-16-79				16		
5th Chemical	Mercury	8-13-79					13	
6th Chemical	Arsenic	9-10-79						10
1st Industry	Federal Facilities	6-11-79			11			
2nd Industry	Smelters	8-6-79					6	
3rd Industry	Power Plants	9-24-79						24

D. Review of Cancer Rates in Region VIII

During the meeting on January 26, 1979, a map of the Region outlining excessive cancer rates by county was distributed. The objective was to have each Committee member refer the map to the appropriate people within their Division or Staff Office in order to determine if some correlation exists between the excessive cancer rates in an area and the industries located in that area. Excessive cancers of a given type were characteristically grouped among counties in a given section of the state.

At a later meeting these cancer maps were added to by superimposing the geographic locations of nine different industry groups within Region VIII over the excessive cancer rates noted for each county. This was distributed to Committee members and they were asked to again review the maps for any possible associations between excessive cancer rates and industries or any other environmental problems. These maps appear as Appendix D.

III. INTEGRATED STRATEGY

A. Description of Work Plan Format

A Work Plan is developed to address each of the priority chemicals and priority industries selected for the Integrated Toxics Strategy. Each Work Plan will vary but generally the format of a Work Plan will be: 1) main objective of the specific Work Plan; 2) introduction on the subject chemical or situation (i.e., manufacture and use, health and environmental effects); 3) outline of the problem(s) caused by the priority chemical or priority situation, the action needed to correct the problem(s), and assignment of Regional Resources to implement the corrective actions; 4) public awareness programs; and 5) a chart of the Resource Allocation Model for each Work Plan.

B. Cooperation with States

Each of the six states within Region VIII is an important participant in properly addressing toxics control problems. It is envisioned that as a Work Plan is developed to address a particular priority chemical or other priority situation, that the state(s) which are involved will mobilize resources to address the situation in partnership with EPA. This will require the development of a strong cooperative spirit in these matters.

Likewise, environmental conditions will frequently exist where the state will be the first to identify the situation. All states in Region VIII are currently organized along categorical lines (air, water, solids, etc.) as is EPA and to focus multi-disciplinery resources on multi-media problems as toxics requires, a coordinating body in each state similar to Region VIII's Toxics Integration Committee is necessary. Thus, it is desirable that each state form such a coordinating body, focus resources on multi-media problems, and bring such problems to the attention of the Region VIII Integration Committee. By directing communication in a state/Federal direction, EPA can provide resources, where needed, toward selected multi-media problems within a state. This would complete a proper communication circle between EPA and each state.

In the case of Montana, since the EPA Montana Office is part of the Region VIII Toxics Integration Committee, the above scenerio will be carried out between the State and the Montana Office directly. This should lead to even better implementation programs for multi-media problems.

C. Referral to Others

Implementation of the various Work Plans will necessitate extensive literature reviews and field inspections to be undertaken. Information gathered as a result of these activities will be assimilated by the Hazard Assessment Section, Toxic Substances Branch, Air & Hazardous Materials Division. As date patterns or problems develop other organizational entities will be informed. These entities include the IRLG agencies, other Federal agencies, industry, other EPA regions, and EPA Headquarters. At times a cooperative data gathering or inspection effort will be performed with the above organizations. Such cooperative ventures may be called for initially in the various Work Plans, but also can be precipitated from information developed as noted above.

D. Addressing New Hazards

New toxic pollutants which may create potential hazards to the environment will be addressed by the Committee. The Committee will characterize these pollutants as they did for the initial Toxics Integrated Strategy. If the new pollutant proves to be a greater hazard then those currently included in the Toxics Integrated Strategy, the Committee will reprioritize the chemicals/industries under the Strategy.

E. Public Awareness

The purpose of a public awareness section within a Work Plan will be to achieve the goal of increasing public knowledge for the specific pollutant or priority situation. Generally, public awareness programs will be addressed to specific target groups within the general public, industry, governmental agencies (federal, state and local), interest groups and in-house personnel. The types of programs that will be presented will be educational (training) and reactive (response to inquiries). To develop a public awareness capability, technical knowledge about the subject matter will be drawn from EPA personnel. Tools to be used for public awareness programs include the listing of priority concerns and responsible individuals who can provide assistance, as well as developing PR mechanisms such as workshops, newsletters, increased news media coverage, speeches and cross-training.

F. Emergency Response

Any Emergency Response activity within a specific Work Plan will be handled according to Regional Order R8 2080.1, Region VIII, Emergency Response Plan (Appendix E). This plan is for any imminent action required to protect public health and safety or the environment.

G. Data Retrieval

Data retrieval will be used extensively for the purpose of developing toxicological and scientific information, gathering health and environmental effects and emission data for the priority chemicals and evaluating situations under the Integrated Toxics Strategy. The sources to be used for this effort will be:

a. Automated systems

   1. SDC
   2. Lockheed
   3. National Library of Medicine

b. Library Sources

c. Industry Data

d. Headquarters

e. Source of Problem

H. Time Schedule

Once all Work Plans have been completed a separate time schedule will be developed to implement a target date for completion of each element under the "Problem Identification and Correction" Section of the various Work Plans.

I. Resources

Until the entire set of Work Plans are completed, a summary of the resources required cannot be included. However, in the interim each Work Plan contains its own "Resource Allocation Model".

J. ZBB

The FY-79 ZBB did not contain any resources for carrying out multi-media efforts as are outlined in this Strategy. Specific media resources are still being used to solve problems directly associated only with that media. It may be necessary for some resources in a given media to be redirected toward multi-media high priority projects with the understanding that the media program will not lose control of the resources that it commits.

Nevertheless, due to the high priority of this effort in Region VIII it seems that the ZBB must contain some line items relating to toxics integration activities and funding for these items should come from headquarters. It seems that the FY-80 budget is unchangable at this point. However, we should certainly be able to justify resources for the FY-81 ZBB.

IV. REPORTS AND ASSESSMENT

The Toxic Substances Branch, which is the focus of implementation activities for the Toxics Integration Committee, will report to the Committee semi-annually beginning November 1, 1979. At that time constructive criticism will be entertained and alterations will be made in the manner in which the Committee functions. Also, priorities will be reviewed and adjusted. It is desirable that the states participate in this meeting as well but travel funds may be a problem. A briefing for the Regional Administrator and Deputy Regional Administrator will result.

A full written report will be made to the Committee and States annually. The written report on November 1, 1979, will consist of the entire Integrated Toxics Strategy with all Work

Plans including implementation action items together with a report on implementation to date. Accomplishment of major milestones in the Strategy will trigger ad hoc reports as they occur.

Assessment of results is an ongoing activity of the Hazard Assessment Section and will be reported to the Committee at their regular meetings.

V. WORK PLANS AND IMPLEMENTATION SCHEDULES

This section will contain the Work Plan and implementation schedule for each chemical/industry listed below. To date only the draft copies of the first two Work Plans are available.

A. PCB'S
B. Asbestos
C. Federal Facilities
D. Cadmium
E. Lead
F. Smelters
G. Mercury
H. Arsenic
I. Power Plants

REGION VIII INTEGRATED TOXICS STRATEGY

PCB

WORK PLAN

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INTRODUCTION

Polychlorinated biphenyls (PCB's) is a generic term applied to certain mixtures of chlorinated organic compounds. The effects of PCB's on the environment have been widely discussed recently. PCB's persist and accumulate in the environment and have been found in samples of air, water, soil, sediments, fish, birds, and mammals (including humans) all over the world. Although the acute toxicity of PCB's is not significant, several chronic effects have been observed. PCB's have, therefore, been considered as a significant hazard to human health as well as to the environment.

MANUFACTURE AND INDUSTRIAL USES

PCB's have been manufactured in the United States since 1929 by the Monsanto Chemical Company; it has been estimated that 800 million pounds have been produced since that time. In 1970, the year of peak U.S. Production, over 85 million pounds of PCB's were produced in the U.S. alone. An estimated one-half million pounds per year of PCB's were imported into the U.S. from foreign manufacturers.

The sole U.S. manufacturer of PCB's was the Monsanto Chemical Company located near East St. Louis, Illinois. Monsanto has marketed its PCB products in the U.S. under the trade name AROCLOR.

PCB's come in both solid and liquid forms and have properties that give them a wide range of industrial applications. In resin form they were used as protective coatings, plasticizers and extenders, sealers in waterproofing compounds and putty, asphaltic materials, printing inks, and synthetic adhesives. In liquid form they were used as dielectrics, hydraulic fluids, thermostats, cutting oils, extreme pressure lubricants, grinding fluids, and heat transfer media. As solids they were used to impregnate carbon resistors, as sealers, and as impregnating agents for electrical apparatus. With few exceptions, other than environmental concerns, the remarkable properties of PCB's make them the best chemical known to make capacitors, transformers, hydraulics, gas turbines, and vacuum pumps work efficiently and safely.

In 1971, because of environmental concerns, Monsanto voluntarily stopped production of Aroclor 1260 and restricted its sales of other PCB's to only "closed" systems. Closed systems are such things as PCB-containing insulating fluids used in electrical transformers and capacitors. These two applications account for essentially all the current use of PCB's in the U.S. On October 5, 1976, Monsanto announced that it would cease to manufacture and distribute PCB's by October 31, 1977. A timetable set by the U.S. Environmental Protection Agency (EPA) called for gradual phasing out of PCB manufacturing by

January 1, 1979, and a ban on all PCB processing or distribution in commerce by July 1, 1979. These steps should reduce the introduction of PCB's into the environment in the future. However, millions of pounds of PCB's still exist in transformers and capacitors still in service. The environmentally safe disposal of these fluids will continue to be of concern for years to come.

OBJECTIVE

The objective of the Regional PCB Work Plan is to control entry of PCB's into the environment by:

1. Aggressively enforcing the TSCA PCB regulation.
2. Identifying and preventing air and water pollution by PCB's.
3. Educating the "public", i.e., those industries handling PCB's.
4. Identifying those elements of organization within Region VIII who will be responsible for the specific tasks detailed in the plan.

I. PROBLEM IDENTIFICATION AND CORRECTION

The flow chart shown in figure 1 basically describes the process to be followed by the Region for controlling PCB's. The following section discusses each portion of the flow chart.

A. Regional Inventory of Sources

The first step is to identify those sites within Region VIII where PCB's are or have been used, stored, or disposed. This involves compiling a detailed list of potential and known sources. A computerized list of potential and known sources has already been developed and will be reviewed for completeness and updated when necessary. A short summary of potential sources is given in Appendix A.

The information gathering can be accomplished by performing the following tasks:

1. Review old city directories, telephone books, trade association, co-op and other organization directories for the entire Region.
2.
2. Use of information gathering authorities contained in CWA, CAA, TSCA, RCRA, if they have been delegated to the regions.

3. Search for information existing in Regional files.

4. Search State and IRLG files for existing information.

ASSIGNMENT: Hazard Assessment Section

B. TSCA PCB Inspections

Upon completion of the regional inventory (or concurrently) the Region will strongly enforce the PCB Disposal and Marking Regulation by conducting inspections of potential and known sources (40 CFR Part 761). Approximately 90 inspections have already been performed in the Region with a number of violations detected. It is contemplated that around 120 such inspections will be performed in FY 79.

Aggressive enforcement of this regulation will control PCB's at the source before pollution occurs.

While present at the sites, in addition to conducting a normal PCB inspection, inspectors will take samples from floor drains, soil in storage yards, fuel oil storage tanks or in any area where it would appear that spills have occurred or where waste oil may be stored.

Results of analysis will be used for enforcement of the TSCA PCB regulation or trigger multi-media inspections for additional environmental monitoring, if required.

Recognizing that not all sites can be inspected, random sampling techniques will be used for choosing inspection sites where appropriate.

ASSIGNMENT: Field Operations Section

C. Laboratory Support

All samples collected will be submitted to the S&A Division who will either provide analysis through the Region's laboratory, contractor laboratories or State laboratories.

The laboratory analysis will be completed in a timely manner so as not to weaken or jeopardize any imminent hazard enforcement action the Region may desire to undertake.

ASSIGNMENT: S&A

PROBLEM IDENTIFICATION/CORRECTION

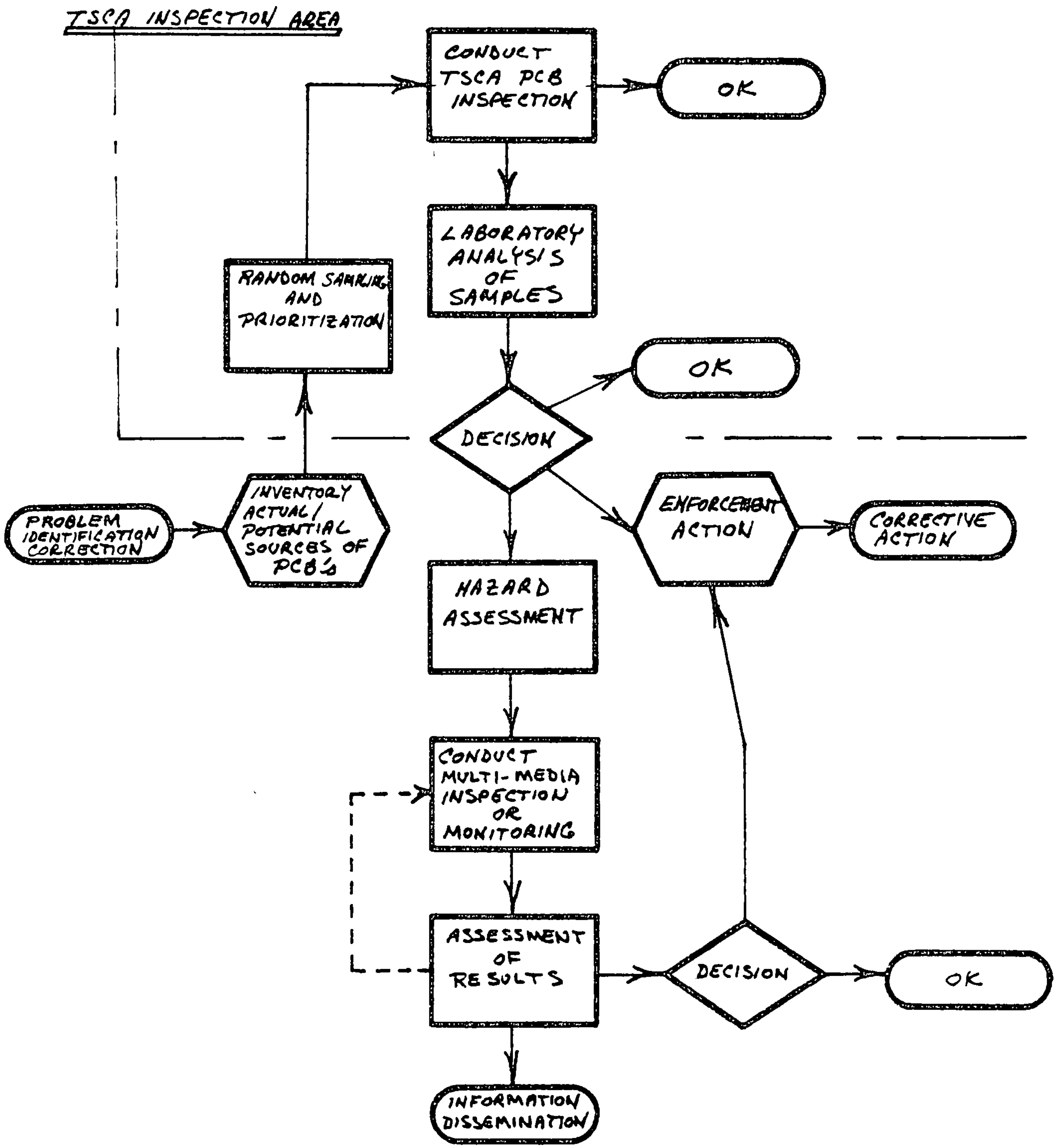


FIGURE I

D. Hazard Assessment

The results of any environmental PCB sample analysis (e.g., air, water, waste) obtained during TSCA inspections or other environmental monitoring such as results from NPDS monitoring or Section 307 of the Clean Water Act will be forwarded to the Hazard Assessment Section (HAS) within the Toxic Substances Branch (TSB). The entity which performed the inspection to obtain the sample will have previously taken any necessary enforcement action regarding the sample. The HAS will attempt to determine the source of the positive PCB sample and if such source has a possible impact on another media or Agency the situation will be explained to that media or Agency for their consideration.

The HAS will also obtain data from other sources (Federal/State agencies) on a continuing basis such as the National Organic Monitoring System and the U.S.G.S. Alert System.

The HAS will accumulate all PCB sample data and periodically analyze the information for patterns or possible problem areas. When such problems manifest themselves HAS will develop a project protocol which will involve resources from each impacted media or Agency that will be aimed toward further characterizing the possible adverse effect on health or the environment. These protocols will take the form of more involved sampling on a multi-media basis together with in-plant sampling by NIOSH or OSHA; sampling organisms in the area for above-background levels of PCB's; or possibly epidemiologic studies on the surrounding population. If enforcement action is warranted from these study results, HAS will forward such cases for enforcement action under the applicable EPA authority.

Thus, HAS will serve as the Regional clearinghouse for all PCB sample data and as a catalyst for additional study in problem areas as they develop.

ASSIGNMENT: Hazard Assessment Section

E. Multi-Media Inspections and Monitoring

Should a multi-media inspection of a facility be required, all air, water, and solid waste practices shall be inspected for compliance with all applicable regulations.

These inspections will include personnel from various program areas as needed. The inspection team will also include

IRLG members as required.

These inspections shall be conducted upon request of the Hazard Assessment Section, Toxic Substances Branch.

ASSIGNMENT: S&A, IRLG, Air Enforcement

F. Publicly Owned Sewage Treatment Plants

For 20 selected plants, Regional EPA personnel who conduct inspections of sewage treatment plants and State Agency personnel, as requested, will collect sludge samples for PCB analysis. This will be done only for the major treatment plants in the Region or for minor plants where there could be potential PCB problems in the sludge or plant effluent. The list of plants which should be sampled will be developed by the Water Division and the Hazard Assessment Section. Receiving stream and other sampling may be initiated if deemed appropriate for problem assessment.

ASSIGNMENT: S&A, Water Division, Hazard Assessment Section

All information gathered shall be submitted to the Hazard Assessment Section, Toxic Substances Branch. After consulting with appropriate program areas, if deemed necessary, case preparation and appropriate remedial or preventative measures shall commence with eventually the case being submitted to the Enforcement Division for corrective action.

ASSIGNMENT: Hazard Assessment Section

G. Information Dissemination

All PCB related information collected shall be disseminated to the appropriate program area. This also includes the IRLG.

Any information obtained will be periodically discussed at the meetings of the Toxics Integration Committee since it is difficult to set specific action levels that apply to all media. The only clear-cut level will be 50 ppm as defined in the PCB Ban Regulation. Water and Air programs will be concerned with much lower levels of PCB's.

ASSIGNMENT: Toxic Substances Branch

H. Enforcement

Cases involving violation of the TSCA will be prepared by the Toxic Substances Branch and forwarded to the Enforcement Division. Violations of Section 307 of the Clean Water Act will be prepared by the Enforcement and Legal Support Branch and transmitted to the General Enforcement Branch. Violations found pursuant to multi-media efforts will be coordinated by the Toxic Substances Branch and forwarded to the Enforcement Division.

ASSIGNMENT: Enforcement Division

II. PUBLIC AWARENESS (PARTICIPATION)

Public awareness is an important means for achieving reduced exposure to PCB's in the environment. Region VIII's public awareness effort will concentrate on informing and alerting the public to PCB hazards and problems associated with using PCB's. Resolution of these issues will also be addressed. The flow chart in figure II shows essentially the public awareness program that will be undertaken in Region VIII.

Information on PCB regulations, policy and issues has already been distributed. However, this should not preclude further information dissemination and feedback from the affected urban and rural public. It is important that good working relationships be developed and maintained among all entities of our defined "public". For purposes of this work plan, the "public" is defined as:

Industry: PCB Sources Possible Within Region VIII

- Transformer Repair
- Electric Utilities
- Scrap Yards
- Investment Casting
- Mines (Surface and Underground)
- Mining Equipment Dealers
- Federal Facilities
- Waste Oil Dealers
- Sewage Treatment Plants
- Major Public Buildings
- Railroads

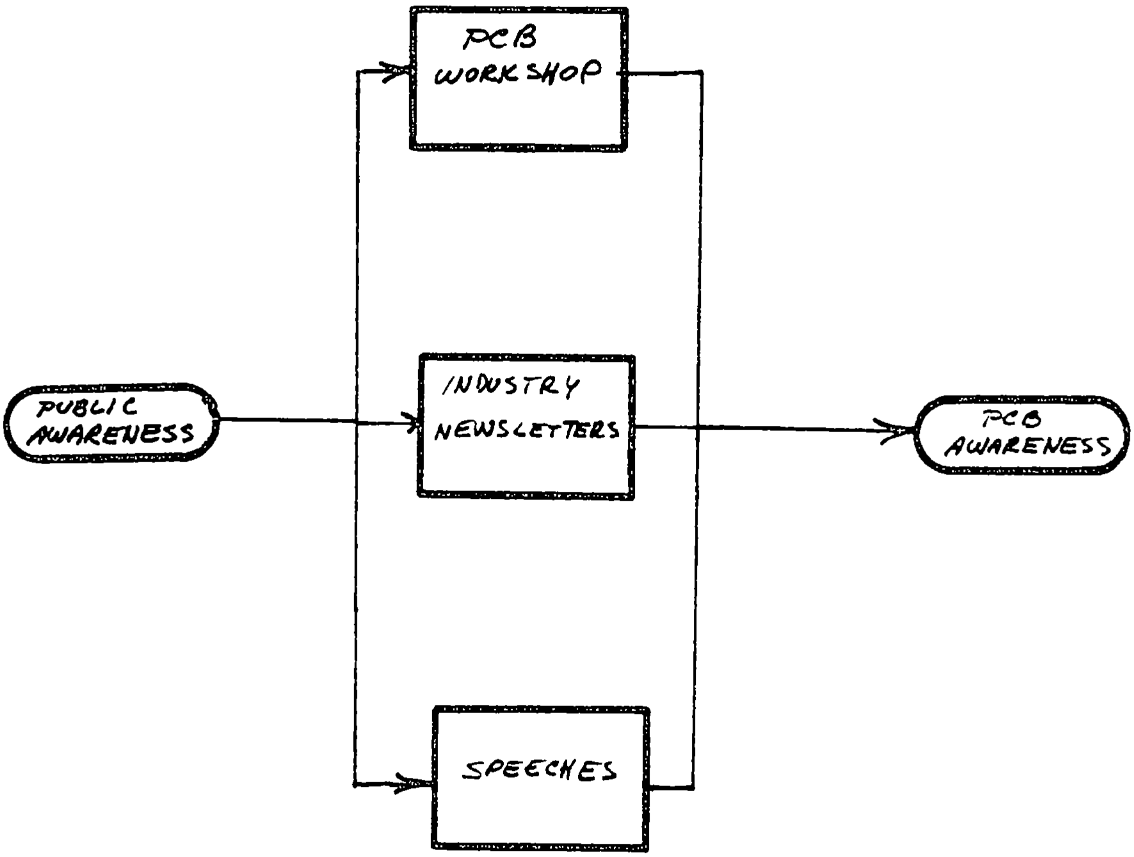
Labor

- Unions
- Labor Councils

Governing Officials

- Federal:
    - EPA (Toxics, Water, Waste Management)
    - OSHA
    - MESA
    - DOT
- State
- Local

PUBLIC AWARENESS



Three public awareness activities will be undertaken as part of this work plan:

A. Industry Workshops

Purpose: To discuss PCB regulations under TSCA Section 6, disposal techniques, policy of EPA and other Federal and State regulating agencies, and emergency response. Industry and labor views and needs will also be a part of the program.

Participants: Industry, labor, OSHA, EPA, MESA, DOT, State and local governing officials, news media.

Length: 1 to 1½ days

Location: Major Population Centers in Region VIII

ASSIGNMENT: Toxic Substances Branch, OPAIR, Waste Management Branch, To Be Completed By October, 1979

B. Address Professional and Trade Association Meetings

EPA employees have already participated in two such meetings; The Colorado Rural Electric Association meeting in Montrose, April 11, 1979, and a Joint Utilities Workshop held in Brookings, South Dakota in March, 1979.

ASSIGNMENT: Hazard Assessment Section, OPAIR

C. Contributions to Newsletters

All chemical trade newsletters within Region VIII will be identified and contacts will be made with the editors. EPA will then attempt to get articles put into these newsletters periodically. Also, appropriate articles will be published in the Region VIII newsletter contemplated by OPAIR.

ASSIGNMENT: Toxic Substances Branch

D. Cross-Training

All regional inspectors shall be briefed on the PCB regulation and instructed to be alert for PCB containing equipment while conducting other types of inspections.

Should equipment or PCB oil be observed, the Toxic Substances Branch shall be notified with the name and address of the firm, along with the inspector's observation. Regional inspectors in all programs will accompany a Toxic Substances Branch inspector on a PCB inspection.

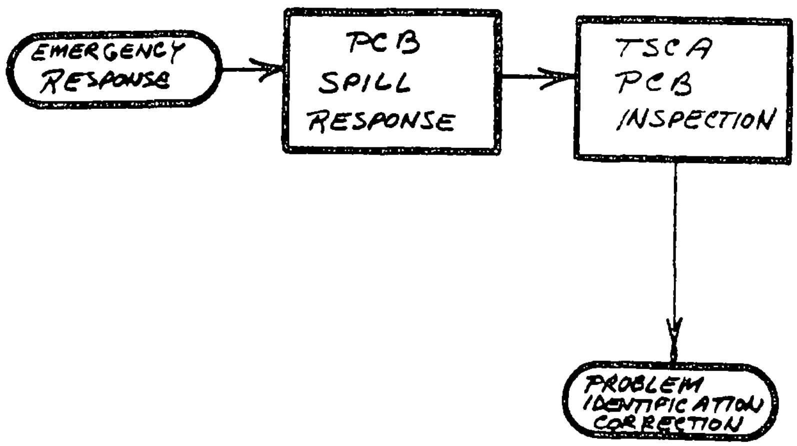
ASSINGMENT: Toxic Substances Branch, To Be Completed By October, 1979

III. EMERGENCY RESPONSE

The Region's response to any environmental emergency involving PCB's shall be according to Regional Order R8 2070.1, Region VIII, Emergency Response Plan. The plan is limited to those immediate actions required to protect public health and safety or the environment (Appendix B). The flow chart describing the Region VIII Emergency Response Plan is shown in figure III.

As a follow-up action on any PCB environmental emergency, The Toxic Substances Branch will conduct a TSCA PCB inspection to ensure compliance with marking and disposal requirements.

EMERGENCY RESPONSE



INTEGRATED TOXICS STRATEGY

RESOURCE ALLOCATION MODEL FOR PCB WORK PLAN

	Level of Effort
A&HM DIVISION	
Toxic Substances Branch	1 my
Hazardous Materials Branch	Disposal Consulting-1/12 my
S&A DIVISION	
Surveillance Branch	Multi-media sampling (2)-1/12 my
Technical Investigations Branch	Analyze samples for PCB's (100)
Emergency Planning & Response Branch	5 Responses - 1/12 my
WATER DIVISION	
Control Technology Branch	Obtain 20 PCB samples from major STP's
ENFORCEMENT DIVISION	
Permits & Compliance Branch	Permit Development - 1/12 my
General Enforcement	Prosecution of violators - 1 my
OPAIR	
	Workshop development Consult on newsletters 1/12 my

Depending on the circumstances, other Branches within the Region may be called upon for various tasks, but it is anticipated that the commitment of resources would be considered incidental.

APPENDIX 1

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: POLYCHLORINATED BIPHENYLS (PCB's)

Major Sources

The major potential sources of PCB's in Region VIII are as follows:

- Transformer Repair Industry

There are approximately 34 repair shops in the Region. The majority of shops do not now repair PCB transformers although most did in previous years. The potential for pollution from past work practices is great along with the fact that many non-PCB transformers are contaminated with PCB's. Several shops are still repairing PCB transformers.

- Electric Utilities

There are approximately 283 sites operated by electric utilities that are potential sources of PCB's. These sites often store large numbers of transformers and capacitors.

- Scrap Yards

All transformers that cannot be repaired are scrapped in the local junk yards. Even if transformers are drained, some oil finds its way to the junk yard. There are approximately 135 scrap dealers in our Region.

- Investment Casting Industry

Only one investment casting shop was located in the Region. Any PCB's present would probably be from past work practices.

- Mines

There are approximately 1154 mining sources in Region VIII where one might find PCB transformers, capacitors, or PCB-containing mining equipment.

- Mining Equipment Dealers

There are approximately 10 dealers where one might find PCB-containing mining equipment.

- Federal Facilities

There are at least 25 sources that have PCB transformers or capacitors. This would include Bureau of Reclamation sites, GSA, and Department of Defense facilities.

- Waste Oil Dealers

There are approximately 6 waste oil dealers in the Region. Many electric utilities and rebuilding shops dispose of waste transformer oil through these dealers.

- Major Public Buildings

Many large buildings contain PCB transformers. It is estimated that approximately 100 exist in the Region.

- Sewage Treatment Plants

Much of the PCB's in industry finds its way into the sewage treatment plants and comes out in the sludge. There are approximately 1153 sources, many of which have never been checked for PCB's.

- Railroads

Many of the railroad facilities may contain PCB transformers or capacitors.

Population At Risk/Environmental Exposure

The sources in our Region are located in both rural and urban environments.

Health and Environmental Effects

PCB's, as a class of compounds, are extremely persistent and non-biodegradable substances, and tend to bioaccumulate in the aquatic environment by factors of a few thousand to several hundred-thousand-fold. The most serious effect of PCB's on aquatic species is their ability to interfere in the reproductive process and hatchability of fish eggs.

The toxicity of PCB's to humans was demonstrated in 1968 when a mass poisoning occurred in Japan. Symptoms included swelling of the upper eyelids, urinal impairment, acne-like formations, and heightened pigmentation of the skin. Patients with this disease also exhibited neurological disorders and showed signs of hearing loss. Babies born to women patients were born smaller than the national average.

PCB contamination is almost universal and has been found in human milk, human adipose tissue and in brain and liver of small children.

Entry Into The Environment

PCB's from the various sources find their way into the environment in all media. When incomplete combustion of waste oil occurs, air pollution occurs, eventually causing water pollution. Improper disposal practices of PCB equipment can cause pollution in all media.

Control Mechansims Available

Air - Air pollution from incineration of waste transformer oil can be prevented only if an adequate temperature and dwell time is obtained to ensure decomposition of PCB's.

Water - Holding ponds with oil skimmers can be used to remove PCB's from water. Also carbon adsorption systems are effective, although expensive in removing PCB's.

Solid Waste - According to the TSCA PCB Disposal and Marking Regulations, certain PCB wastes must go to EPA-approved landfills.

Strong enforcement of the Marking and Disposal Regulation will control PCB's at the source before pollution occurs. NPDES permits can also be used.

Current Agency and Other Efforts

EPA under TSCA has a Marking and Disposal Regulation for PCB's. A manufacturing, processing , and distribution in commerce regulation is about to become final.

FDA proposed lowering the existing guidelines for PCB's in certain foods in April, 1977. NIOSH published a criteria document in September of 1977.

Cost/Benefit

Since the benefits are health-related, they are difficult to quantify. The costs involved in controlling PCB's would be the cost of performing inspections at each facility.

ENVIRONMENTAL PROTECTION AGENCY

TRANSMITTAL

Addressee

R8 2070.1

APPENDIX II

Region VIII

January 22, 1979

EMERGENCY PROGRAMS - ENVIRONMENTAL EMERGENCIES

MATERIAL TRANSMITTED:

Regional Order R8 2070.1, Region VIII, Emergency Response Plan.

MATERIAL SUPERSEDED:

None.

FILING INSTRUCTIONS:

File the attached material in a three ring binder established for the Region VIII Directives System.

Alan Merson
Regional Administrator

Dist: 2:Emergency Response Team

ENVIRONMENTAL PROTECTION AGENCY

ORDER

R8 2070.1

Region VIII

January 22, 1979

EMERGENCY PROGRAMS - ENVIRONMENTAL EMERGENCIES

REGION VIII ENVIRONMENTAL EMERGENCY RESPONSE PLAN

1. PURPOSE. This Order establishes the Emergency Response Plan and assigns responsibility for implementing the Plan.

2. AUTHORITY. EPA authority to respond to a variety of situations that pose a real or imminent hazard to public health and safety or the environment is contained in the following Public Laws: Clean Air Act; Clean Water Act; Safe Drinking Water Act; Resource Conservation and Recovery Act; Federal Insecticide, Fungicide, and Rodenticide Act; and Toxic Substances Control Act.

3. SCOPE. This Plan applies to all environmental emergencies occurring within EPA Region VIII. Such emergencies may involve discharges of oil into waters of the United States or release of toxic chemicals or hazardous substances into the environment. The Plan is limited to emergency response activities; i.e. those immediate actions required to protect public health and safety or the environment. The resolution of non-emergency problems will be handled with the non-emergency authorities of the Public Laws described in Paragraph 2. The Plan supplements EPA-wide emergency procedures and directives and other Regional emergency plans including the Oil & Hazardous Substances Pollution Contingency Plan (OHSPCP), the Air Pollution Episode Avoidance Plan, the Disaster Assistance Coordination Manual, and the Emergency Readiness Manual. This Plan does not supersede the above mentioned plans, procedures, or directives.

4. PROCEDURES.

a. Duty Officer. The Chief or Acting Chief of the Emergency Planning and Response Branch (EPRB) in the Surveillance and Analysis Division serves as the duty officer during normal working hours. During other than normal working hours during the week, the EPRB Chief will designate a standby duty officer for each day in order to maintain 24-hour coverage of the emergency reporting telephone line.

b. On-scene Coordinator (OSC). The OSC is the designated person in charge of the EPA response at the scene of an environmental emergency. The OSC is designated by the EPRB Chief.

c. PROGRAM AREA REPRESENTATIVES. Principal and alternate representatives of regional programs are designated in Attachment 1 to supplement the EPRB staff

Dist 2: Emergency Response Team

Initiated by EPRB

during an environmental emergency. Any or all designated program representatives may become a part of the EPRB staff during an environmental emergency and function under the direction and supervision of the OSC. The list of assigned personnel will be reviewed periodically and adjusted as necessary.

d. Response Activation. Upon receipt of a report that oil has been spilled into United States' waters, or that a toxic substance or hazardous material has been released into the environment, the duty officer has three options:

(1) If the size of the spill or release and the resulting hazard to human health and the environment is such that EPA response is not necessary or warranted, the duty officer will so inform the caller. EPA response may not be necessary if adequate response will be provided by another government agency. A record will immediately be made of the call including the date and time; name, title, and location of the caller; location of the spill or release; the type and quantity of substance or material involved; and an explanation of his judgment not to respond to the episode. This record will be maintained in the EPRB. Copies of all phone calls involving hazardous waste generators, transporters and treatment, storage or disposal facilities, should be hand carried to the Waste Management Section, Air and Hazardous Materials Division, to determine compliance with the Resource Conservation and Recovery Act (RCRA), Subtitle C regulations or equivalent state regulations.

(2) If the information provided by the caller in the report of a spill or release is insufficient, or the duty officer's information concerning the potential hazard of a substance or material is inadequate to dictate immediate EPA response, he will promptly consult with appropriate designated program representatives to determine whether such response is indicated. If a decision not to respond is made, the duty officer will so notify the caller, following the procedure contained in paragraph (1) above. If a decision to respond is made, the duty officer will follow the procedure contained in paragraph (3) below.

(3) If EPA emergency response to a spill or release is clearly indicated based on information furnished, the duty officer will immediately notify designated principal or alternate representatives from appropriate program areas, as needed, that they have become a part of the EPRB as a member of the emergency response team for the incident.

The circumstances of the emergency, including the substance, media, and support necessary will dictate which program area representative(s) will be activated. The duty officer will notify EPRB Chief (or Acting Chief), who will assign an OSC for the emergency response team. At the conclusion of the emergency, program area representatives will be deactivated by the OSC or by joint agreement between the EPRB Chief and the program supervisor. Deactivation disagreements will be resolved by the appropriate Division Directors or (as a last resort) by the Regional Administrator.

e. Response Activities. The OSC will carry out the responsibilities stated in Chapter 3, Part I of the Regional OHSPCP. Response activities will follow the 5 operational phases described in the Regional OSHPCP -- as follows:

Phase I - Discovery and Notification
Phase II - Evaluation and Initiation of Action
Phase III - Containment and Countermeasures
Phase IV - Cleanup, Mitigation, and Disposal
Phase V - Documentation and Cost Recovery

In addition, the OSC will notify the appropriate state agency. In the event water supplies may be threatened, the OSC will request the appropriate state agency to notify downstream water users. If the state cannot respond to this request, EPA will assume this responsibility.

f. Emergency Funding. The OSC is authorized to verbally obligate funds not exceeding $400 for immediate mitigatory actions during any emergency situation, providing:

(1) The expenditure of funds is under the direct control of an on-scene federal or state official;

(2) The spiller or cause of the episode will not or cannot take appropriate action;

(3) Manpower and/or equipment are immediately available; and

(4) Immediate action will minimize or preclude significant environmental damage.

5. RESPONSIBILITIES. It is not practical to staff the EPRB with personnel having the wide range of technical expertise necessary to respond to the myriad varieties of emergency episodes. To do so would simply duplicate the capabilities contained in other program areas of the Region Office. This Plan utilizes the capabilities of various program officers to provide full EPA response to environmental emergencies. The responsibilities of various program offices are described below.

a. Emergency Planning and Response Branch.

(1) Through a duty officer, provide 24-hour monitoring of the emergency telephone number (303-837-3880) to accept all reports of oil spills and releases of toxic chemicals or hazardous materials and activate response.

(2) Designate an OSC to assemble the emergency response team (including program area representatives as needed) and carry out the responsibilities stated in paragraph 4.

(3) Monitor the progress of each phase of response.

(4) Assure that the Regional Administrator is apprised of all major environmental episodes and significant events during response action.

(5) Activate the Regional Response Team in accordance with provisions of the Regional OHSPCP when appropriate or when required.

(6) Obtain participation of appropriate state and/or local officials.

(7) Inform Office of Public Awareness and Intergovernmental Relations of significant oil and hazardous substances spills or other environmental emergencies.

(8) Notify the Waste Management Branch representative of an emergency occurring during the loading, transporting, or unloading of a hazardous waste.

(9) Notify the Waste Management Branch radiation representative of any emergency event involving radioactive materials.

(10) Notify the Control Technology Branch of emergencies affecting public water supply systems.

(11) Notify the Toxics Substances Branch of any significant emergency event involving toxic substances or pesticides.

b. Office of Public Awareness and Intergovernmental Relations (OPAIR).

(1) Depending on the severity and circumstances of the emergency, the OPAIR Director will decide their response to the emergency.

(a) For spills or emergencies considered consequential to the Region, an OPAIR representative will accompany the OSC to the emergency scene and serve as the OSC's liaison to the news media.

(b) For less significant emergencies, after consultation with the OSC, OPAIR may wish to contact news media in the emergency vicinity and provide them with information about the events.

(2) Issue, when appropriate and after consultation with the On-scene Coordinator, news releases to inform the public of an existing problem, actions by EPA, cleanup progress, or other significant occurrences.

(3) Arrange for radio or television interviews or appearances, when appropriate, of EPA representatives involved in emergency response activities.

(4) Notify Congressional home offices of significant environmental emergencies.

c. Office of Regional Counsel.

Provide legal interpretations of the emergency or imminent hazard sections of EPA statutory authorities to determine EPA's responsibilities and limits (if any) thereon.

d. Technical Investigations Branch, Surveillance and Analysis Division.

(1) Provide personnel for investigation of fish kill episodes and assist in damage assessment surveys.

(2) Recommend the number, type, and size of samples required to assess the nature and magnitude of an emergency episode.

(3) Perform laboratory analyses on samples collected.

e. Surveillance Branch, Surveillance and Analysis Division.

(1) Provide on-site monitoring of gaseous releases that may result in hazardous air quality conditions.

(2) Provide advice on the need to evacuate areas subjected to hazardous air quality conditions.

f. Control Technology Branch, Water Division.

(1) Alert the appropriate state water supply program(s) and, if necessary, immediately affected water suppliers, of the incident and its potential for water supply contamination.

(2) Insure that proper tests are conducted on drinking water supplies that may be affected by spills to assure protection of public health.

(3) Determine appropriate treatment techniques or procedures that may be used to remove the contaminant from drinking water (surface or subsurface).

(4) Provide advice on resolution of ground water contamination problems.

g. Enforcement and Legal Support Branch, Enforcement Division.

(1) Initiate all enforcement actions that are appropriate resulting from environmental episodes. Prepare all legal documents relating to enforcement actions, and work with the U.S. Attorney's Office to represent EPA in such actions.

(2) Assist the On-scene Coordinator in matters of "right-of-entry," search warrants or any other situation which may pose legal questions on-scene or during the emergency.

h. Toxic Substances Branch, Air and Hazardous Materials Division.

(1) Provide toxicological data and information concerning spilled pesticides and toxic chemicals involved in an incident.

(2) Describe the chemical properties, and provide information on personal safety, protective clothing, decontamination, and disposal of spilled pesticides or toxic chemicals.

(3) Maintain a list of Poison Control Centers from which emergency information may be obtained.

(4) If the incident involves a pesticide or a TSCA regulated chemical, conduct the appropriate investigation for possible violations under FIFRA, as amended, or TSCA.

i. Waste Management Branch, Air and Hazardous Materials Division.

(1) Provide information and expertise necessary to effect environmentally safe storage, treatment or disposal of such materials or waste as specified under regulations set forth in Subpart A, 250.10 Criteria, Identification and Listing of Hazardous Wastes in Subpart C of the Resource Conservation and Recovery Act (RCRA).

(2) In coordination with appropriate state and local agencies, determine disposal sites for spilled oil or hazardous materials.

(3) Provide technical expertise, field radiation measurements and assistance during EPA response to radiation emergencies.

(4) Notify EPA Headquarters of the existence of a radiation emergency.

j. Air Branch, Air and Hazardous Materials Division.

(1) Provide meteorological information, as needed, during any environmental emergency.

(2) Based on meteorological information, provide recommendations on the area extent of evacuation zones during emergencies causing hazardous air quality conditions.

k. Administrative Services Branch, Management Division.

(1) Provide logistics (vehicles, space, etc.) and supply support during environmental emergencies.

(2) Provide purchasing and contracting support.

l. Montana Office.

For emergency events in Montana, this office will have the same responsibilities of the various program areas. If this office cannot perform any particular responsibility, the responsibility will revert to the appropriate program area.

Alan Merson
Regional Administrator

ATTACHMENT I

EMERGENCY RESPONSE TEAM
PROGRAM AREA REPRESENTATIVES

OFFICE	PRINCIPAL	ALTERNATE
Emergency Planning & Response Branch	Alvin Yorke	Richard Jones
Office of Public Awareness and Inter-governmental Relations	Richard Lathrop	Jo Harrison
Surveillance and Analysis Division		
Technical Investigations Branch		
Field	Cornelio Runas	Loys Parrish
Laboratory	John Tilstra	Bob Tauer
Surveillance Branch	Keith Tipton	Bill Basbagill
Water Division		
Control Technology Branch	Jack Hoffbuhr	Dean Chausse
Enforcement Division		
Enforcement and Legal Support Branch	John Lepley	Steve Jones Greg Halburt Al Smith
Air and Hazardous Materials Division		
Toxic Substances Branch		
Information	Ralph Larsen	Dallas Miller
Investigations	Dan Bench	Henry Bonzek
Waste Management Branch		
Hazardous Wastes	Henry Schroeder	Jon Yeagley
Radiation	Paul Smith	John Giedt
Air Branch	Donald Henderson	
Management Division		
Administrative Services Branch	Ellis Linn	Alfred Broach
Office of Regional Counsel	Joseph Muskrat	Kemper Will
Montana Office	Dick Montgomery	Bob Fox

REGION VIII INTEGRATED TOXICS STRATEGY

ASBESTOS WORK PLAN

TABLE OF CONTENTS

OBJECTIVE

The objective of the Regional Asbestos Work Plan is to control entry of asbestos into the environment by:

1. Developing a program to enforce EPA regulations contained in Title 40, Code of Federal Regulations, Part 61, as amended; Subpart B - National Emission Standard for Asbestos.

2. Conducting an active program as developed under the Toxic Substances Control Act (TSCA) for the voluntary control of asbestos in public schools.

3. Encouraging each state within our Region to designate at least one disposal site suitable for asbestos wastes.

4. Educating the "public" i.e., those industries or citizens handling asbestos.

5. Promoting interagency cooperation rearding asbestos control.

INTRODUCTION

The recognition of the potential health hazards from exposure to asbestos fiber and the increasing use of asbestos in numerous products over the past thirty years has resulted in the U.S. Environmental Protection Agency (EPA) and other federal agencies promulgating regulations governing its safe handling to protect public health and the environment.

Asbestos in all its forms is considered a serious respiratory hazard and is a known carcinogen. Research is inconclusive as to whether asbestos is a health hazard in the gastrointestinal tract when ingested. Unlike most chemical carcinogens, the fibers persist in the environment almost indefinitely and in certain instances represent a continuous source of exposure.

Manufacture and Use

Seventy-four percent of all asbestos used commercially goes into construction materials. Only eight percent of this amount is not bonded into products. Examples of loose asbestos materials include insulation, asbestos cement powders, and acoustical materials. Twenty-six percent of commercial asbestos goes into non-construction products. Such products include textiles, friction materials including brake linings and clutch facings, paper, paints, plastics, roof coatings, floor tiles, and miscellaneous other products. Asbestos mining and milling operations are not found in Region VIII except that some mines are located where asbestiform minerals occur in the soil being mined. Several different types of asbestos exist, but one type predominates in commercial products. This is chrysotile asbestos. Other types include amosite, crocidolite, tremolite, anthophyllite, and actinolite. The summary table which characterizes asbestos includes all of the industrial sources of commercial asbestos in Region VIII. As can be seen, Region VIII is a relatively small user of asbestos and most of the industries listed are small operations. Most of the industrial sources listed are found in the Denver-metro area and in Colorado. There are very few asbestos processing plants outside of Colorado in Region VIII. In addition to the presence of asbestos noted above, EPA is currently concerned about asbestos exposure through sprayed decorative and insulation uses in schools and public buildings together with asbestos exposure upon building demolition.

Health and Environmental Effects

Asbestos fibers find entry into the body by inhalation and ingestion. The retained mineral fibers are found in tissues throughout the life-time of the host, even long after cessation of exposure. Fibers may migrate to other organs following retention in the lung. Asbestosis and certain malignancies are related to exposure to fibers of the asbestos minerals. Asbestosis is a progressive, restrictive pulmonary fibrosis associated with inhalation of asbestos fibers, and is a classic occupational disease.

Malignancies related to the inhalation (and possibly ingestion) of asbestos fibers by epidemiologic studies include carcinomas of the lung, mesotheliomas of the pleura and peritoneum, and neoplasms of other sites. Asbestos has a potent cocarcinogenic effect with cigarette smoking in carcinoma of the lung. Asbestos workers who are smokers have over 90 times the risk of nonexposed nonsmokers.

The population at risk includes not only those engaged in the manufacture and use of asbestos products, but also bystanders and others limited to neighborhood and familial exposures, including persons exposed to friable, sprayed asbestos in buildings.

Definition of the relationship of low levels of asbestos exposure and carcinogenesis remains uncertain and difficult. The extended latency period, lack of adequate past exposure data, effect of other carcinogens, and variability of human response makes the quantification of risk only approximate. Asbestos-related malignancies exhibit latency periods of 20 to 40 years and may follow exposures of much less duration and magnitude as seen with asbestosis.

Excess malignancies have been found in proximity to emission sources and in households of asbestos workers. In these cases the exposures seem to have been variable and generally low (about 100 nanograms/m^3). Asbestos fiber contamination levels within or exceeding these ranges have been documented near building sites using sprayed asbestos, in offices, schools, and apartment buildings with exposed, friable asbestos ceilings, with use of materials such as spackling compound, and near roads and other areas covered with asbestos-containing crushed rock. This indicates continuing environmental contamination and exposure to asbestos at levels considered carcinogenic. An expanding population at risk has been identified by these findings of widespread exposure. The impressive annual asbestos production and evidence of urban environmental contamination has led observers to conclude that the incidence of asbestos-induced malignancies has only begun to be defined.

I. PROBLEM IDENTIFICATION AND CORRECTION

A. TSCA Voluntary Asbestos Control Program for Public Schools

On March 16, 1979, EPA alerted State officials across the country to potential hazards in some school buildings from materials containing asbestos fibers.

1. Asbestos Control Program

The asbestos control abatement program is designed to encourage States and school authorities to initiate voluntary efforts to identify and correct asbestos problems, particularly in public schools. It has three major components:

- Preparation and dissemination of a detailed technical document providing guidance on identifying asbestos-sprayed materials, estimating the potential for exposure to asbestos because of deterioration of such materials, and procedures for sealing or removing such materials. The document will provide the criteria to be used in deciding what action should be taken in various circumstances. This technical document will be distributed to all States and school districts and will be available, upon request. to other interested parties.

- Development of a quality assurance program to ensure that laboratories will be able to correctly identify asbestos. OTS will suggest analytical protocols and quality assurance procedures that States may follow to obtain accurate analysis.

- A voluntary reporting program. States and/or school districts will be asked to furnish EPA information on the extent of the asbestos problem and their efforts to deal with it.

2. Implementation in Region VIII

The number of school districts in Region VIII are as follows:

Colorado - 181
Montana - 575
North Dakota - 317
South Dakota - 187
Utah - 40
Wyoming - 51

Each school district in the Region will receive the guidance package.

In addition to mailing the guidance package to school districts, private schools, State Health Departments, State Education Departments, Local Health Departments and other interested parties will receive a copy of the guidance package.

A training session was held in Denver on April 16, 1979, at which approximately 100 persons from school districts and state and local agencies were in attendence.

Assigned to Region VIII until September 30, 1979, is a civil engineer from Pullman-Kellogg Corporation who will be available to school districts for advice and guidance. His assistance has already been requested and given to numerous districts in our Region.

It is anticipated that through FY '80 the Region will receive numerous requests for technical assistance regarding asbestos. However, after the contractor is no longer available there will be no resources available for on-site assistance.

ASSIGNMENT: Toxic Substances Branch

B. <u>ASBESTOS DISPOSAL</u>

1. <u>Background</u>

The code of Federal Regulations Title 40, Subpart B - National Emission Standard for Asbestos 61.20 - 61.25 declares asbestos to be a hazardous air pollutant and outlines emission and disposal standards for asbestos. These regulations specify operational procedures that if followed, allow the disposal of asbestos waste without the approval of EPA. Deviation from these regulations requires approval by the Regional Administrator. Basically, the regulations require that: 1) there are no visable emissions; 2) the property is posted with warning signs; 3) the site is fenced to provide security and; 4) the waste is covered every 24 hours with 6 inches of compacted soil or sprayed with a petroleum based dust suppressant. In addition to these requirements, the regulations published under Section 4004 of this Resource Conservation and Recovery Act, Criteria for Sanitary Landfills, should also be followed. The main objective of the air regulations is to provent air emissions of asbestos.

2. EPA Role/Action

Under the TSCA school asbestos program, more asbestos will likely be removed from schools and present a greater hazard because there are no sites in Region VIII which meet the above criteria. Members of both the Toxic Substances Branch and the Waste Management Branch will develop mechanisms to provide a proper disposal facility for asbestos. This will involve requesting that each state designate a site that meets the disposal criteria. It is believed that the hazard of future digging is a more serious problem than leaching of asbestos at this time, so it is desirable that the placement of asbestos be mapped so that future owners will not dig in that area.

ASSIGNMENT: Waste Management Branch

C. NESHAPS Inspections and Enforcement

1. Background

In addition to the disposal requirements, the National Emission Standard for asbestos requires that prior to any demolition or renovation of structures which contain more than 160 square feet of asbestos that the contractor performing such renovation must notify EPA (in Colorado that State has primacy) in writing at least 20 days prior to the demolition or renovation. The notification must include information about the proposed operation. The actual operation can have no visible emission and to ensure this requirement is met, certain procedures must be followed by the contractor. These procedures include removal of asbestos material prior to demolition or renovation of the structure after wetting the surfaces. Also, such material must be handled without dropping, it to the ground and if the material is more than 50 feet above ground level it must be lowered via dust-tight chutes or containers. Such procedures do not seem consistent with today's demolition technology without serious dislocations.

The above provisions are generally not currently being complied with by the construction industry in Region VIII, nor is the Region placing any enforcement resources toward such compliance.

2. EPA Role/Action

Personnel from the Toxic Substances Branch will survey the other nine Regions and headquarters inquiring about industry compliance and EPA enforcement pursuant to the above provisions of the asbestos NESHAP.

ASSIGNMENT: Toxic Substances Branch

After reviewing the current posture on this issue around the nation, Region VIII will make a decision as to how the Region will address this situation. Should it be found that the regulation and its enforcement are unrealistic, it would be in keeping with the President's policy on needless or unworkable regulations to recommend to Headquarters that amendment of this particular NESHAPS be embarked upon.

ASSIGNMENT: Enforcement Division; Regional Counsel, Toxic Substances Branch, Air Branch, Chairman, Toxics Integration Committee DRA, RA

As developments occur this section of the Asbestos Work Plan will be amended.

Any inspections pursuant to the enforcement of the asbestos NESHAPS will be coordinated with OSHA and NIOSH as an IRLG effort.

ASSIGNMENT: Enforcement Division, Toxic Substances Branch

Asbestos removal operations at two schools in the Region will be monitored for compliance with the asbestos NESHAPS by the end of calendar year 1979. If two such removals are unavailable in that time-frame, the schedule will be lengthened. These actions will be coordinated with OSHA and NIOSH.

ASSIGNMENT: Toxic Substances Branch, Enforcement Division, Waste Management Branch

D. Other Sources of Asbestos

Appendix 1 is a summary of the characteristics of asbestos in Region VIII including the industrial sources of possible exposures to surrounding neighborhoods. Ambient air sampling in the immediate neighborhood of a small subset of these industries is a viable project as part of our attempt to control asbestos exposure. However, given the Regional resources available for all aspects of the Integrated Toxics Strategy such a compling program is of lower priority. Therefore, this section is meant to merely point out that such a project is worthwhile, but that unless future events make this a higher priority (e.g., an incident resulting in significant neighborhood exposure or results of other research indicating that a significant hazard exists), no resources will be committed at this time.

E. Hazard Assessment

Unusual or high exposure situations will be referred to the Toxic Substances Branch by the Enforcement Division and the Waste Management Branch. These situations will be reviewed for possible joint inspections or IRLG coordination. Data from such situations will be reviewed and analyzed by the Toxic Substances Branch for possible further study or research.

ASSIGNMENT: Hazard Assessment Section

F. Information Dissemination

The Hazard Assessment Section will distribute summary data which characterize the asbestos problem to Region VIII's field people, Headquarters, IRLG agencies, school districts and the public.

ASSIGNMENT: Hazard Assessment Section

II. PUBLIC AWARENESS (PARTICIPATION)

Public awareness is an important means for achieving reduced exposure to asbestos in the environment. Region VIII's public awareness effort will concentrate on informing and alerting the public to asbestos hazards.

The following tasks will be conducted as part of the Region VIII program:

Conduct asbestos training sessions in each state for school districts by the end of calendar 1979. (Estimate - 6)

Provide video tapes and guidance packages to concerned citizens and organizations.

Disseminate information to the construction industry informing them of the NESHAPS requirements in an effort to bring about voluntary compliance.

ASSIGNMENT: Toxic Substances Branch, OPAIR

INTEGRATED TOXICS STRATEGY

RESOURCE ALLOCATION MODEL FOR ASBESTOS WORK PLAN

A&HM Division

Toxic Substances Branch	½ my plus contractor support
Hazardous Materials Branch	Disposal Consulting - ½ my
Air Branch	Review of NESHAPS - ½ man-month

S&A Division

Water Division

Enforcement Division

Permits & Compliance Branch	Review & Enforcement of NESHAPS - ½ my
General Enforcement	Review & Enforcement of NESHAPS - ½ man-month

OPAIR

Support with Media - ½ man-month

Regional Counsel

Decision on Enforcement of NESHAPS - ½ man-month

Depending on the circumstances, other Branches within the Region may be called upon for various tasks, but it is anticipated that the commitment of resources would be considered incidental.

APPENDIX A

METALS NOT CHOSEN FOR STUDY IN REGION VIII
AND REASONS THEREFORE

Aluminum (Al) - no chronic toxicity

Antimony (Sb) - acute data only

Barium (Ba) - pneumoconiosis (occupational); not mined in Region VIII; as sulfate is used in oil & gas well drilling

Beryllium (Be) - acute exposure causes Be disease, but environmental limits can be 10 to 15 times the 2 micrograms/cu. meter limit

Chromium (Cr) - metal not toxic
Cr^{+3} not toxic
Cr^{+6} (chromates) - carcinogen
0.05 mg/l Cr^{+6} USPHS water limit

Cobalt (Co) - no chronic toxicity

Copper (Cu) - no chronic toxicity

Gallium (Ga) - no chronic toxicity; no known present hazard

Indium (In) - no chronic toxicity

Iron (Fe) - benign pneumoconiosis (occupational exposure to high temp. Fe oxide fumes leads to bronchiogenic carcinoma but the population at risk is not large

Lanthanons (elements 57-72) - acute data only

Lithium (Li) - no chronic toxicity

Magnesium (Mg) - no chronic toxicity

Manganese (Mn) - chronic toxicity exists in the form of "Manganese Pneumonia" (occupational); not actively mined in Region VIII, but exists as a by-product of mining operations in Montana; greater than 600 ppm creates adverse health effects

Metal Carbaryls ($Me_x(CO)_y$) - $Ni(CO)_4$ - cancer of lung & nose (occupational) from nickel refinery

Nickel (Ni) - no chronic toxicity

Niobium (Nb) - no chronic toxicity

Platinum Group Metals - no chronic toxicity

Strontium (Sr) - no chronic toxicity

Tantalum (Ta) - no chronic toxicity

Thallium (Tl) - no chronic toxicity

Thorium (Th) - no chronic toxicity

Tin (Sn) - inhaled as dust, oil, fume; benign pneumoconiosis (occupational); not mined in U.S.

Titanium (Ti) - no chronic toxicity

Tungsten (W) - no chronic toxicity

Uranium (U) - no chronic toxicity

Zirconium (Zr) - no chronic toxicity

<u>Source</u>: "Industrial Hygiene and Toxicology", Second Revised Edition, Vol. II, 1963.

APPENDIX B

SUMMARY OF COMMENTS RECEIVED FROM
STATES AND IRLG AGENCIES CONCERNING
THE CHEMICALS CONSIDERED

COLORADO

- Particularly concerned about: ammonia, asbestos, zinc, lead, mercury, PCB's.

- Compounds of limited interest: molybdenum, arsenic, beryllium, hydrogen sulfide, parathion, sodium hydroxide

MONTANA

- Of least importance for study are: ammonia, arsenic, zinc, vanadium, and molybdenum.

NORTH DAKOTA

- The principle substance of concern is the disposal of lignite-fired boiler ash in abandoned mines since it contains traces of most of the chemicals which we are considering for study. However, their position is that since no contamination has manifested itself, we should take a "wait and see" attitude regarding the undertaking of further study.

- An adequate data base already exists for all chemicals under consideration, so a thorough literature review should be done before any studies are undertaken.

- No further regulations are needed to further control any of the chemicals listed.

SOUTH DAKOTA

- They concur with the toxics thrust we are developing.

- We should consider studying selenium and nitrates/nitrites from irrigation return flows.

- Vanadium should be deleted from consideration.

UTAH

- They concur with the toxics thrust and would advocate an industry-by-industry approach in some cases.

WYOMING (Solid Waste Management)

- Wyoming's groundwater monitoring program will be designed to monitor for all of the chemicals. This is from landfills. EPA will do the same for industrial sites. Hence, from a solid waste point of view, no strategy is needed.

WYOMING (Land Quality Division)

- Delete from consideration: cadmium, zinc, and vanadium.

- We should consider studying: radionuclides (uranium mining), phenols (coal gasification), 2,4-D and 2,4,5-T, hydrocarbons (coal gasification), nitrates/nitrites (ammonia to nitrates in in-situ mining process).

WYOMING (Air)

- Consider studying asbestos emissions from the Atlantic City ore deposit.

WYOMING (water)

- Consider studying ammonia compounds released from in-situ mining operations.

CONSUMER PRODUCT SAFETY COMMISSION

- Consider studying phosphates in water from detergents, ammonia and formaldehyde used in insulation -- has been found to be a mutegen).

- They concur with the toxics thrust.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION

- Consider studying polybrominated biphenyls.

- They agree with our list and concur with the toxics thrust.

FOOD AND DRUG ADMINISTRATION

- They do not understand how the list was compiled and so will not comment.

- Delete from consideration molybdenum.

APPENDIX C

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: ASBESTOS

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
Building Demolition	Mostly urban neighborhoods	Data on the health effects of low concentrations in ambient air are very scarce & possibly tenuous.	Air emissions > 100 ng/m^3	Wetting surfaces Asbestos removal prior to razing (in sealed bags)	EPA Asbestos Hazardous Air Pollution National Emission Standards -- No visible emissions	Costs a) Inspection for visible emissions from building excavation includes neighborhood sampling
Buildings constructed with asbestos building materials (facings, insulation)	Schools, public Bldgs	Diseases related to asbestos exposure: occupational asbestosis, bronchogenic cancer, and mesothelioma	Air emissions some > OSHA standard	Downtrend in use of loose asbestos	EPA voluntary school inspection program	b) Carry on technical assistance with schools c) Neighborhood air sampling
Possible Industrial Sources Facilities Abrasive Products (3) Adhesives and Sealants (3) Asbestos Products (4) Asphalt Felts & Coatings (8) Brick & Structural Clay Tile (13) Ceramic Wall & Floor Tile (7) Clay Refractories (5) Gaskets, Packages & Sealing Devices (13) Industrial Furnaces & Ovens (4) Non-Clay Refractories (2) Non-Metallic mineral products (15) Non-Woven Fabrics Shipbuilding & repairing (2) Weaving (2) Yarn Mills	Mostly urban neighborhoods (Highly concentrated in Denver & Colorado)	May be cocarcinogenic with cigarette smoking or certain metals. "Family" cases are known to exist (i.e., exposure from washing contaminated clothes resulted in disease) Good dose-response data is lacking, but less than 2 fibers/cc of air seem necessary to protect against asbestosis. The epidemiology of various fiber lengths is lacking Research has not conclusively implicated gastrointestinal disease with oral ingestion of asbestos fibers Occupational exposure data clearly implicates asbestos as a causitive factor in the above diseases.	Air emissions possible, but not known. Concentrations are unknown.	None	OSHA Workplace Stds. of 2 fibers/cc NIOSH proposal to lower std to .5 fibers/cc Local Government Action Ambient Air Limits: - NM 10 ng/m^3 CT 30 ng/m^3 NY City banned asbestos spray applications Increasing attention is being paid to ambient asbestos levels by local governments	Benefits a) Apprehend violators of visible emissions Neighborhood air sampling develops baseline data for probably the highest asbestos concentrations found in ambient air (i e., around demolition sites b) Over time this program will abate relatively high concen= trations sources from young children who have long latency periods in which to develop disease. c) Sampling at some of the most likely sites where higher concentrations may be found will develop baseline data This would be a first attempt at eventually controlling industrial sources if, in fact, any significant emissions are occuring
Coal and Ore Mining and Milling		Not demonstrated	Water	Multi-media filtration	BAT for Toxics Review	Insufficient health effects data due to water-borne sources of asbestos makes the cost/benefit of such study very low However, asbestos does exist in some water supplies (e g , Duluth, San Francisco) and health effects are still under study.

REGION VIII TOXICS INTEGRATED STRATEGY

NARRATIVE ACCOMPANYING THE CHEMICAL ASBESTOS

Sources

Seventy-four percent of all asbestos used commercially goes into construction materials. Only eight percent of this amount is not bonded into products. Examples of loose asbestos materials include insulation, asbestos cement powders, and acoustical materials. Twenty-six percent of commercial asbestos goes to non-construction products. Such products include textiles, friction materials including brake linings and clutch facings, paper, paints, plastics, roof coatings, floor tiles, and miscellaneous other products. The asbestos mining and milling operations are a small industry and not found in Region VIII. Several different types of asbestos exist, but one type predominates in commercial products. This is chrysotile asbestos. Other types include amosite, crocidolite, tremolite, anthophyllite, and actinolite. The summary table includes all of the industrial sources of commercial asbestos in Region VIII. As can be seen, Region VIII is a relatively small user of asbestos and most of the industries listed are small operations. Probably the most fertile ground for investigation of asbestos as an air pollutant would be in building demolition and the inspection of buildings already constructed, since in 1950 more than one-half of all multi-story buildings constructed in the United States used some form of separated mineral fiber fireproofing. Most of the industrial sources listed are found in the Denver-metro area and in Colorado. There are very few asbestos processing plants outside of Colorado in Region VIII.

Population At Risk/Environmental Exposure

Regarding demolition of buildings containing asbestos, the population at risk is the general public in the neighborhood or sector of the city of the construction work. This could be considered mostly an urban problem. If any emissions are occurring from the industries listed, they would involve the sector of the city or general neighborhood of the industry, again mostly urban situations.

It is interesting to note that Dr. Irving Selikoff analyzed almost 2,000 autopsies in three large New York City hospitals and found asbestos in 40% of the housewives, 50% of the white collar males, and 50% of the blue collar males. No health significance was related to this finding but it does indicate that in the urban environment there does exist significant asbestos fibers which people aspire into their lungs.

Health and Environmental Effects

Most of the health data regarding asbestos involves the asbestos mineral chrysotile, but little is known about the health effects of other fibers. Some would assume that the health effect is the same for the different fibers, but others would dispute that. The variables which impact health seem to be the concentration of asbestos fibers, the fiber size (length and width), and the type of asbestos involved. Most of all asbestos research deals with occupational exposures. As mentioned on the sheet, the three principle diseases we are examining regarding asbestos are asbestosis, bronchogenic cancer and mesothielomia. There is very little data bearing on the health effects of low concentrations of asbestos in the ambient air. In 1968 the British Occupational Hygiene Society stated after reviewing medical evidence that "as long as there is any air-borne chrysotile dust in the work environment, there may be some small risk to health." Nevertheless, it should be realized that exposure up to certain limits can be tolerated for a life time without incurring undue risks." We should keep this factor in mind when determining the necessity of studying asbestos in the ambient air. They also stated that early clinical signs of asbestosis would be reduced to less than 1% of those exposed to 2 fibers/cc for 50 years of exposure. This means that given 24-hour exposures of people in the general population, this level of asbestosis might occur with about ½ fiber/cc in the ambient air. If this dose response for asbestosis could be considered accurate, then this level could be considered an environmental ambient standard. However, additional consideration should be given to the carcinogenisis aspect. Of course, as the dose rate becomes progressively lower, the latent period (the time taken to actually show symptoms of the disease) may approach or exceed the life span of exposed individuals.

Entry Into The Environment

Nothing is found in the literature to detail the concentrations of asbestos released into the ambient air from the industries stated on the summary sheet. Also regarding demolition activities, asbestos emission is certain, but concentrations are again unknown. Research has shown that routine activity in a building containing asbestos-sprayed materials which are fraying can give rise to levels near to and even exceeding the occupational limit of 2 fibers/cc, especially during sweeping and dusting operations. Urban ambient air studies have shown asbestos concentration levels to be less than 10 nanograms/m^3 of air and rarely exceed 100 nanograms/m^3. The relation between nanograms/m^3 and fibers/cc are not precise, but a rough estimate is that 100 nanograms/m^3 is roughly equivalent to .02 fibers/cc. Ambient environmental levels of asbestos found in U.S. cities in 1969 were 4.3 nanograms/m^3 and in 1970 2.1 nanograms/m^3. Higher urban readings occured in communities with large asbestos emission sources such as factories and areas near construction sites where asbestos spraying was in progress. Even lower levels were found in non-urban areas.

Routine maintenance and repair work on buildings with fraying asbestos-sprayed surfaces can create greater than 20 fibers/cc. Asbestos removal operations in a building can create greater than 100 fibers/cc and general custodial work shows concentrations in the area of 5 fibers/cc. These levels compare to the occupational standard of 2 fibers/cc. One study showed that a school with sprayed asbestos surfaces during routine activity showed between 10 and 50 fibers/cc.

It should be noted that excess malignancies have been found in proximity to emission sources and in households of asbestos workers. In these cases the exposures seem to have been variable and generally low, about 100 nanograms/m^3. Asbestos fiber contamination levels within or exceeding these ranges have been documented near building sites using sprayed asbestos. This indicates that continuing environmental contamination and exposure to asbestos still exists at levels considered carcinogenic.

Control Mechanisms Available

The level of emissions from industries using asbestos in their processes are unknown. It is likely that extremely low or no emissions may be occurring from some of these especially small industries. Regulations promulgated by EPA in 1973 specify procedures for removal and stripping of frayable sprayed asbestos fireproofing and insulation materials prior to demolition. The required work practices include wetting surfaces and disposal of the removed material to an approved sanitary landfill. Fiber levels in such operations are not specified, but the regulations require that there be no visible emissions exterior to the structure. After the removal of asbestos material from a building, demolition can proceed. It should be noted that there is a downtrend in the use of loose asbestos material in construction products due to the known health effects.

Current Agency and Other Efforts

Certain State and local governments have taken an interest in ambient asbestos concentrations in the environment and New Mexico has promulgated regulations calling for no more than 10 nanograms/m^3 of asbestos in the ambient air. Connecticut's standard is 30 nanograms/m^3. New York City has banned the spray application of asbestos and local governments are increasingly concerned about asbestos in the ambient air and are moving toward promulgation of regulations in this area.

Summary

Region VIII contains few industries which process asbestos materials and the emissions from such facilities are not known. It would seem that a research effort is more in order to examine these sources than having a place in the Toxics Integrated Strategy. Certainly building demolition is an area that needs our attention as well as existing buildings with asbestos-sprayed surfaces. The health effects of high asbestos concentrations are well documented in the literature, but little is known about low levels (< 2 fibers/cc) of asbestos in the ambient air. Though such low levels may in fact create health problems, it gives us little justification in the Toxics Integrated Strategy to further examine such health effects since this is more of a research effort. The three conceivable activities of EPA regarding asbestos containment would be field inspection for visible emissions from building excavaution sites which would also involve neighborhood sampling. Secondly, we can carry on our technical assistance effort with schools. Finally, general ambient air sampling from various neighborhoods containing industries which process asbestos would develop baseline data. Some of the above ideas border on research but at the same time can be considered abatement activities since over time these programs would control or at least characterize relatively high concentrations of asbestos from building sites and possibly industrial settings. Insufficient health effects data from water-borne sources of asbestos makes the benefit of such study minimal and thus such was not considered in this analysis.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL Ammonia

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
Oil Refineries: Colorado - 5 Montana - 7 North Dakota - 3 Utah - 9 Wyoming - 13	Urban/Rural	Toxic to humans, animals, plants, fish	Air/Water	Carbon Monoxide Scrubbers	Proposed OSHA standards - November 1975. EPA NPDES Permits	Resource Allocation. Multimedia monitoring, including ground-water sampling, of major sources and surrounding areas Benefit: Develop baseline data of ammonia levels in suspect areas
Coke Plants: U.S. Steel - Orem, UT CF&I - Pueblo, CO	Urban	Toxic to humans, animals, plants	Air	Smokeless Charging of Coke Ovens	Proposed OSHA Standards - November 1975.	
Wastewater Treatment Plants	Urban/Rural	Toxic to Fish	Water	Biological Processes Chlorination Ion Exchange Process	EPA In-stream limitations	
Feedlots	Urban/Rural	Toxic to Fish	Water/Air	Total Runoff Containment	EPA NPDES Permits	
Misc. Industries (Chemical plants, fertilizer manufacturers, laboratories, etc)	Urban/Rural	Toxic to humans, animals, plants	Air	Gas wet scrubbers Impregnated activated charcoal Bag Filters Wet scrubbers Electrostatic precipitators	Proposed OSHA Standards - November 1975	
Combustion (Fuel oil, coal, natural gas, bottled gas, propane, wood, forest fires)	Urban/Rural	Toxic to humans, animals, plants	Air	Unknown	Unknown	

AMMONIA

Major Sources of Ammonia Production (Region VIII)

Oil Refineries: The following list shows Region VIII's oil refineries and the towns in which each is located, along with the 1970 census population figures for each town.

Colorado

Asamera Oil (U.S.), Inc.	Commerce City	17,407
Continental Oil Co.	Commerce City	17,407
Gary Western Co.	Fruita	1,822
Morrison Refining Co.	Grand Junction	20,170
Williams Refining Co.	Denver	514,678

Montana

Big West Oil Co.	Kevin	-1,000
Cenex	Laurel	2,500-5,000
Continental Oil Co.	Billings	61,581
Exxon Co.	Billings	61,581
Kenco Refining Inc.	Wolf Point	3,000
Phillips Petroleum Co.	Great Falls	60,091
Westco Refining Co.	Cut Bank	2,500-5,000

North Dakota

Amoco Oil Co.	Mandan	11,000
Northland Oil & Refining Co.	Dickinson	12,400
Westland Oil Co.	Williston	11,280

Utah

Amoco Oil Co.	Salt Lake City	175,885
Caribou Four Corners, Inc.	Woods Cross	3,124
Chevron U.S.A.	Salt Lake City	175,885
Husky Oil Co.	North Salt Lake	2,143
Morrison Petroleum Co.	Woods Cross	3,124
Phillips Petroleum Co.	Woods Cross	3,124
Plateau, Inc.	Roosevelt	2,005
Western Refining Co., Inc.	Woods Cross	3,124
Phillips Petroleum Co.	Salt Lake City	175,885

Wyoming

Amoco Oil Co.	Casper	39,500
C&H Refinery, Inc.	Lusk	1,000
Glacier Park Co.	Osage	350

Wyoming

Glenrock Refining Co.	Glen Rock	1,515
Husky Oil Co.	Cheyenne	43,000
Husky Oil Co.	Cody	5,161
Little America Refining Co.	Casper	39,500
Mountaineer Refining Co. Inc.	LaBarge	204
Sage Creek Refining Co.	Cowley	366
Sinclair Oil Corp.	Sinclair	445
Southwestern Refining Co., Inc.	LaBarge	204
Texaco, Inc.	Casper	39,500
Wyoming Refining Co.	Newcastle	3,432

The following table was take from Environmental Sources and Emissions Handbook, Marshall Sittig, 1975:

Ammonia Released From Oil Refineries

Source	Lb/100 Barrels Fresh Feed
Compressor - internal combustion	0.2
Fluid - bed catalytic cracking units	54.0
Thermofor catalytic cracking units	5.0

EPA Region VIII has no standards set for ammonia emissions to the air, and is not currently monitoring ammonia air emissions from any of the major sources listed.

EPA does set effluent limitations on ammonia as part of its NPDES permit program. These range from .24 to 8.3 pounds of ammonia as N per 1,000 bbl (barrel) of feedstock, depending on the refining process used and the control technology available.

Coke Plants

No data could be found on ammonia air emissions from coke-oven plants in Region VIII.

Wastewater Treatment Plants

The background level of ammonia coming from secondary level wastewater treatment plants is 15 mg/l. Both chlorination and the ion exchange process reduce ammonia levels to 0.

Feedlots

EPA NPDES permits now require total containment of feedlot runoff. Solid waste from feedlots is sometimes used for land treatment. No figure could be found as to the amount of ammonia in the environment produced by feedlot operations.

Miscellaneous Industries

A list of occupations with potential exposure to ammonia is given as Attachment 1. Accurate figures on the amount of ammonia each of these industries produce are unavailable.

Combustion

Combustion is the major source of urban-produced ammonia. The following breakdown is from the Environmental Sources and Emissions Handbook, Marshall Sittig, 1975:

Ammonia Emissions From Combustion

Combustion Source	Amount of Emission
Coal	2 lb/ton
Fuel Oil	1 lb/1,000 gal.
Natural gas	0.3 to 0.56 $lb/10^6ft^3$
Bottled gas (lintane)	1.7 $lb/10^6ft^3$
Propane	1.3 $lb/10^6ft^3$
Wood	2.4 lb/ton
Forest fires	0.3 lb/ton

Toxicity

25 ppm in air was selected in the U.S. as the threshold limit value to protect against eye and respiratory tract irritation and discomfort among unprotected workers. At high concentrations, ammonia is an asphyxiant. Attachments II, III, and IV contain tables showing reactions of humans and certain species of mammals, plants and fish to various ammonia concentrations.

Summary

Approximately 99.9% of ammonia is produced by naturally-occurring biological processes. The greatest danger concerning ammonia appears to be in the transportation of anhydrous ammonia, where the possibility of an accident is always present. Most publications referred to and the people consulted at EPA agreed that ammonia exists in concentrations below the level considered hazardous to humans, animals and plants and is therefore not a major pollutant of the environment. Ammonia in water is hazardous to fish, but high concentrations are currently controlled by EPA's permit programs.

Attachment I

TABLE XI-2
OCCUPATIONS WITH POTENTIAL EXPOSURE TO AMMONIA

Acetylene workers	Manure handlers
Aluminum workers	Metal extractors
Amine workers	Metal powder processors
Ammonia workers	Mirror silverers
Ammonium salt makers	Nitric acid makers
Aniline makers	Organic chemical synthesizers
Annealers	Paper makers
Boneblack makers	Perfume makers
Braziers	Pesticide makers
Bronzers	Petroleum refinery workers
Calcium carbide makers	Photoengravers
Case hardeners	Photographic film makers
Chemical laboratory workers	Plastic cement mixers
Chemical manufacturers	Pulp makers
Coal tar workers	Rayon makers
Coke makers	Refrigeration workers
Color makers	Resin makers
Compressed gas workers	Rocket fuel makers
Corn growers	Rubber cement mixers
Cyanide makers	Rubber workers
Decorators	Salt extractors, coke oven byproducts
Diazo reproducing machine operators	Sewer workers
Drug makers	Shellac makers
Dye intermediate makers	Shoe finishers
Dye makers	Soda ash makers
Electroplaters	Solvay process workers
Electrotypers	Stablemen
Explosive makers	Steel makers
Farmers	Sugar refiners
Fertilizer workers	Sulfuric acid workers
Galvanizers	Synthetic fiber makers
Gas purifiers	Tanners
Gas workers, illuminating	Tannery workers
Glass cleaners	Textile (cotton) finishers
Glue makers	Transportation workers
Ice cream makers	Urea makers
Ice makers	Varnish makers
Ink makers	Vulcanizers
Lacquer makers	Water base paint workers
Latex workers	Water treaters
Maintenance workers (janitors)	Wool scourers

Adapted from references 7-9

TABLE 6-5 *Attachment II*

Physiologic Response to Various Concentrations of Ammonia by Man and Bats[a]

Physiologic Response	Ammonia Concentration, ppm Man[b]	Bat
Odor is detectable	≥53	≥approx. 100
Causes immediate irritation of throat	≥408	Unknown
Causes irritation of eyes	≥698	≥approx. 1,350
Causes coughing	≥1,720	≥approx. 3,500
Maximal concentration allowable for prolonged exposure: 1-9 h[b]	85-100	3,000
Maximal concentration allowable for short exposure: 1 h[b]	50-100	3,000-5,000
0.5-1 h	300-500	5,000-5,500
Dangerous for even very short exposure (0.5 h)	2,500-6,500	5,500
Rapidly fatal for short exposure (0.5 h)[b]	5,000-10,000	30,000

[a]Derived from Henderson and Haggard[2] and Mitchell.[3]

[b]Periods used in bat study.[3]

TABLE 6-6

Ammonia Tolerance of Selected Mammals[a]

Animal	Elapsed Exposure Time until Death at Various Ammonia Concentrations					
	500 ppm	1,000 ppm	3,000 ppm	5,000 ppm	7,000 ppm	10,000 ppm
Man[b]	0.5-1 h					
Laboratory mouse		16 h[c]	2.5-3 h	10-20 min		
Laboratory rat		16 h[c]		30-40 min		
M. californicus[d]			1-9 h			
M. lucifugus					35-45 min	
E. fuscus					1-2 h	10-20 min
T. brasiliensis				>4 days[e]	2-3 h	10-20 min

[a] Derived from Studier *et al.*[7]

[b] Data from Henderson and Haggard.[2]

[c] Data from Weedon *et al.*[8]

[d] Data from Mitchell.[3]

[e] Data from Studier.[5]

TABLE 2

TIME IN MINUTES UNTIL 50% INJURY TO EXPOSED PLANT SURFACES AT 700,000 $\mu g/m^3$ [71]

Part of Plant	Plant	Time (min)
Leaves	Tomato	3
	Buckwheat	5
	Tobacco	8
Stems	Tomato	60
	Buckwheat	30
	Tobacco	240

Benedict and Breen[9] fumigated 10 species of common weeds which occur throughout the United States in an effort to develop a method for identifying pollutants causing damage. The ammonia produced spots of cell collapse and death, primarily along the margins of the leaves. With grasses, small spots developed over the area where the leaf bends, giving a powdery appearance. The powdery marking increased in the region between the bend and the tip as the intensity of fumigation was increased. Table 3 shows the percentage of leaf area marked by ammonia at concentrations of 8,400 $\mu g/m^3$ and 2,100 $\mu g/m^3$. Table 4 shows the relative sensitivity of the weeds to ammonia.

Barton[8] exposed radish seeds and spring rye seed to 700,000 $\mu g/m^3$ and 175,000 $\mu g/m^3$ of ammonia in air. Both dry and soaked seeds were used in each case. The germination of soaked radish seeds exposed for as long as 240 minutes to 700,000 $\mu g/m^3$ of this gas was not only delayed but actually

TABLE 3

PERCENTAGE OF LEAF AREA MARKED BY AMMONIA[9]
(Four-hour fumigations)

Plant	Concentration of Ammonia 8,400 $\mu g/m^3$ 3 wk[a] Moist[b]	8,400 $\mu g/m^3$ 6 wk[a] Moist[b]	8,400 $\mu g/m^3$ 6 wk[a] Dry[b]	2,100 $\mu g/m^3$ 3 wk[a] Moist[b]	2,100 $\mu g/m^3$ 6 wk[a] Moist[b]	2,100 $\mu g/m^3$ 6 wk[a] Dry[b]
Mustard	33	48	8	15	10	8
Sunflower	32	32	2	4	2	2
Lamb's-quarters	5	20	11	2	2	1
Cheeseweed	5	19	3	1	1	1
Annual bluegrass	6	11	1	2	1	1
Kentucky bluegrass	4	13	1	0	0	0
Dandelion	3	8	2	0	0	0
Chickweed	1	9	1	0	0	0
Pigweed	2	4	2	1	2	1
Nettle-leaf goosefoot	1	1	1	0	0	0

[a]Age of plants.
[b]Soil condition.

TABLE 4

RELATIVE SENSITIVITY OF WEEDS TO AMMONIA[9]

Sensitive	Intermediate	Resistant
Mustard	Lamb's-quarters	Dandelion
Sunflower	Cheeseweed	Chickweed
	Annual bluegrass	Pigweed
	Kentucky bluegrass	Nettle-leaf Goosefoot

Table I. Summary of Toxicity Data

Attachment IV

Organism	Toxicity mg/l as N Un-ionized Ammonia	Source
Trout spawn	0.25-0.33 LC_{50}	Wuhrmann and Woker (1948)
Brown trout fry	0.33 10 hr. LC_{60}	Penaz (1965)
Rainbow trout	0.4 LC_{50}	Lloyd and Herbert (1960)
Rainbow trout	1.5 LC_{50}	Merkens and Downing (1957)
Rainbow trout	0.4 24 hr. LC_{50}	Ball (1967)
Rainbow trout	0.5 LC_{50}	Herbert and Shurben (1963)
Rainbow trout	0.4-0.58 24 hr. LC_{50}	Herbert and Shurben (1965)
Rainbow trout	0.39 24 hr. LC_{50}	Lloyd and Orr (1969)
Rainbow trout	0.18 48 hr. LC_{15}	Ball (1967)
Rainbow trout	0.09 48 hr. LC_{5}	Ball (1967)
Rainbow trout	0.55 44 hr. LC_{5}	Ball (1967)
Rainbow trout	6 weeks exposure to 0.005 caused gill hyperplasia	Burrows (1964)
Atlantic salmon smolt	0.23 24 hr. LC_{50}	Herbert and Shurben (1965)
Roach	0.35 96 hr. LC_{50}	Ball (1968)
Rudd	0.36 96 hr. LC_{50}	Ball (1968)
Bream	0.4 96 hr. LC_{50}	Ball (1968)
Perch	0.29 96 hr. LC_{50}	Ball (1968)
Common carp	0.74-1.1 10-day LC_{17}	Ball (1968)
Common carp	0.09 35-day LC_{8}	Flis (1968)
Gold fish	1.6-2.0 LC_{100}	McKee & Wolf (1963)
Brook trout	2.5 24 hr. LC_{100}	McKee & Wolf (1963)

Table I. Summary of Toxicity Data

Organism	Toxicity mg/l as N Un-ionized Ammonia	Source
Carp, Shiner	4.0 LC_{100}	McKee & Wolf (1963)
Suckers, Trout	4.0 LC_{100}	McKee & Wolf (1963)
Creek chub	4.0 24 hr. LC , 15-21C	McKee & Wolf (1963)
Suckers, Shiner, Carp	5.2 24 hr LC_{100}	McKee & Wolf (1963)
Bluegill, Sunfish	6.0 48 hr. LC_{50}	McKee & Wolf (1963)
Fathead minnows	7.0 48 hr. LC_{50}	McKee & Wolf (1963)
Bluegill, Sunfish	7.4 48 hr. LC_{50}	McKee & Wolf (1963)
Sucker, Shiner, Carp	8.0 15 min. LC_{100}	McKee & Wolf (1963)
Small fish	12.0 24 hr. LC_{100}	McKee & Wolf (1963)
Creek chub	12.0 24 hr. LC_{100}	McKee & Wolf (1963)
Perch	12.0 LC_{100}	McKee & Wolf (1963)
Mosquitofish	14.8 96 hr. LC_{50}	McKee & Wolf (1963)

From a review of the literature regarding the toxicity of ammonia to aquatic biota, the European Inland Fisheries Advisory Commission (1970) concluded that it was unlikely that concentrations lower than those adversely affecting fish would be toxic to other organisms. Therefore, it appears that fish will be the critical organisms when establishing an in-stream limitation and although it may appear that different species of fish exhibit dissimilar susceptibilities to un-ionized ammonia, such is not the case. Trout and carp are equally susceptible to un-ionized ammonia given time to react; although time-based responses are different, the ultimate response to a given concentration of un-ionized ammonia is the same (Ball, 1967).

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: Arsenic (Inorganic) As

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
(1) Copper Smelters (a) Anaconda 1. Anaconda, MT - 12.5 ton/mo (b) Kennecott Copper Corp. Magna, UT -12.5ton/mo (2) Lead Smelters (a) American Smelting & Refining Company East Helena, MT (3) Miscellaneous Emissions	Large human population located near these smelters: Anaconda - pop. 10,000 E. Helena - pop. 22,730 Salt Lake City - pop. 175,885	Arsenic is a notorious poison that in concentrated amounts can cause adverse effects such as liver and kidney damage. It is also a suspect human carcinogen and birth defect agent in the environment in proximity to the source. Chronic toxicity - exposure to greater than 0.1mg/ cubic meter. Aquatic toxicity - Fish tolerances range from 2.5mg/l with no effect to 60.0mg/l which is 48 hr. median tolerance limit.	Air (90%) Arsenic trioxide (As_2O_3) Water (10%) Arsenous acid (H_3AsO_3)	No ambient air std. No landfill requirement. Waste water discharge permits allow 2.0 mg/l max. per day. Clean Water Act- 0.05mg/l	OSHA worker limit: 4.0 ug/m^3 T.W.A. 8hr	Resource Allocation (1) Multimedia inspection of of major producers. (2) Check neighborhoods in close proximity to the producers and check the hospital records for increased mortality rates and chronic arsenic poisoning effects. Benefits realized from resource allocation: (1) Increased knowledge of background for future studies. (2) To ensure that pollution abatement is working and no futher environmental degration is taking place.

ARSENIC

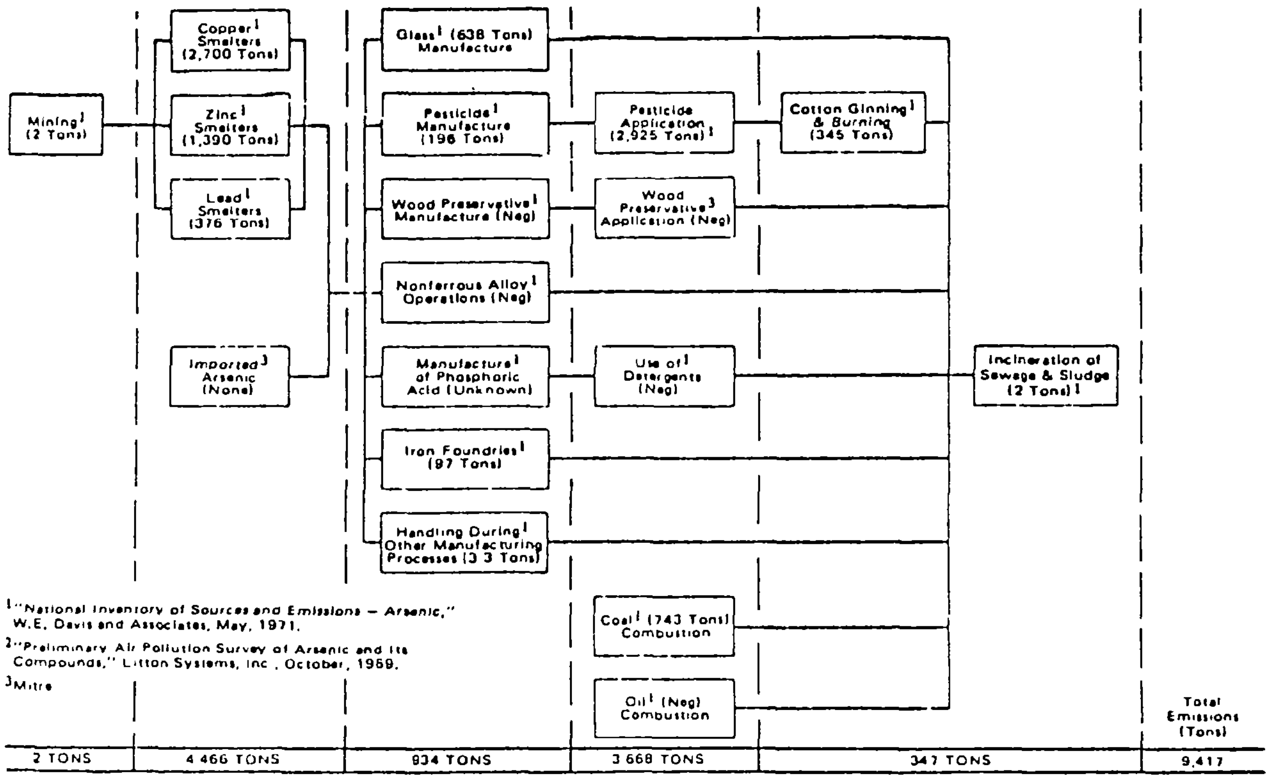
Although arsenic is ubiquitous in the environment, there are activities which cause arsenic to accumulate in the environment. The major arsenic activities in Region VIII are copper and lead smelting and the mining of copper, lead and gold-bearing ores. The copper and lead smelting activities expose a greater human population to arsenic than do the mining operations.

The acute health effects of arsenic to humans are well documented but the chronic health effects are not well understood. Some studies suggest that arsenic is a carcinogen while other researchers using the same data do not reach the same conclusions. Toxicity data suggest that herbivores are more tolerant of arsenic than are the carnivores. In fact, arsenic may be a micro-nutrient in the herbivores' diet. The aquatic environment also has a high tolerance. Arsenic seems to bio-accumulate more in marine fish and shellfish, suggesting a higher tolerance of arsenic than fresh water fish.

Arsenic enters the environment in many forms, both inorganic and organic. The primary inorganic form is that of arsenic trioxide (As_2O_3). This form of arsenic, As(III), is more toxic than As(V). The chief use of organic arsenic is in pesticides and desiccants. These uses are now undergoing R.P.A.R. by EPA.

Even though arsenic is regulated by EPA, OSHA, and FDA, these agencies now are preparing plans to coordinate monitoring, compliance and enforcement when appropriate in order to decrease duplication among these agencies or within an individual agency. This work group also recommends that in the future, for pollutants of interest to several regulatory programs, a comprehensive health/risk assessment be completed for all media and not a specific assessment of exposure for each route individually.

FIGURE 2: MATERIAL FLOW THROUGH THE ECONOMY SHOWING PRIMARY EMISSION SOURCES – ARSENIC



Source: Reference (6)

TABLE 3-22

Chemical and Biologic Transformation of Arsenicals in Soil[a]

Reactions and Changes	Relative Rate of Change	Products	Biologic Activity	Probability of Occurrence	Conditions for Occurrence	Further Possible Changes
1. Salt formation	Fast	Insoluble arsenical salts	Insoluble and inactive	Very high	Presence of iron, aluminum, calcium, and magnesium in soil	Formation of an arsenic analogue of fluoroapatite, an extremely insoluble complex mineral
2. Adsorption	Fast	Soil-arsenic complex	Fixed and inactive	High	Fine soil (colloidal and organic matter)	Formation of sediment in aquatic systems
3. Ion exchange	Fast	Soil-arsenic complex	Fixed and inactive	High	Soil with high exchange capacity	Exchange release by other salts to react further as 1 or 2
4. Demethylation	Slow	Inorganic ortho-arsenic acid	Reacts as 1, 2, and 3	Low	Microorganisms for demethylation (aerobic)	Same as 1, 2, and 3
5. Reduction	Slow	Arsines	Very active	Low	Aerobic and anaerobic conditions or specific microorganisms	Reacts rapidly to form pentavalent arsenical; then same as 1, 2, and 3
6. Oxidation[b]	Moderate	Pentavalent arsenicals	React as 1, 2, and 3	High	Normal soil conditions (aerobic)	Same as 1, 2, and 3
7. Methylation	Slow	Methylarsines	Very active	Low	Presence of specific bacterial microorganisms (anaerobic and aerobic)	Reacts rapidly to form pentavalent arsenical; then same as 1, 2, and 3

[a] Adapted from The Ansul Company report.[19a]
[b] Refers to oxidation of arsenic from trivalent to pentavalent.

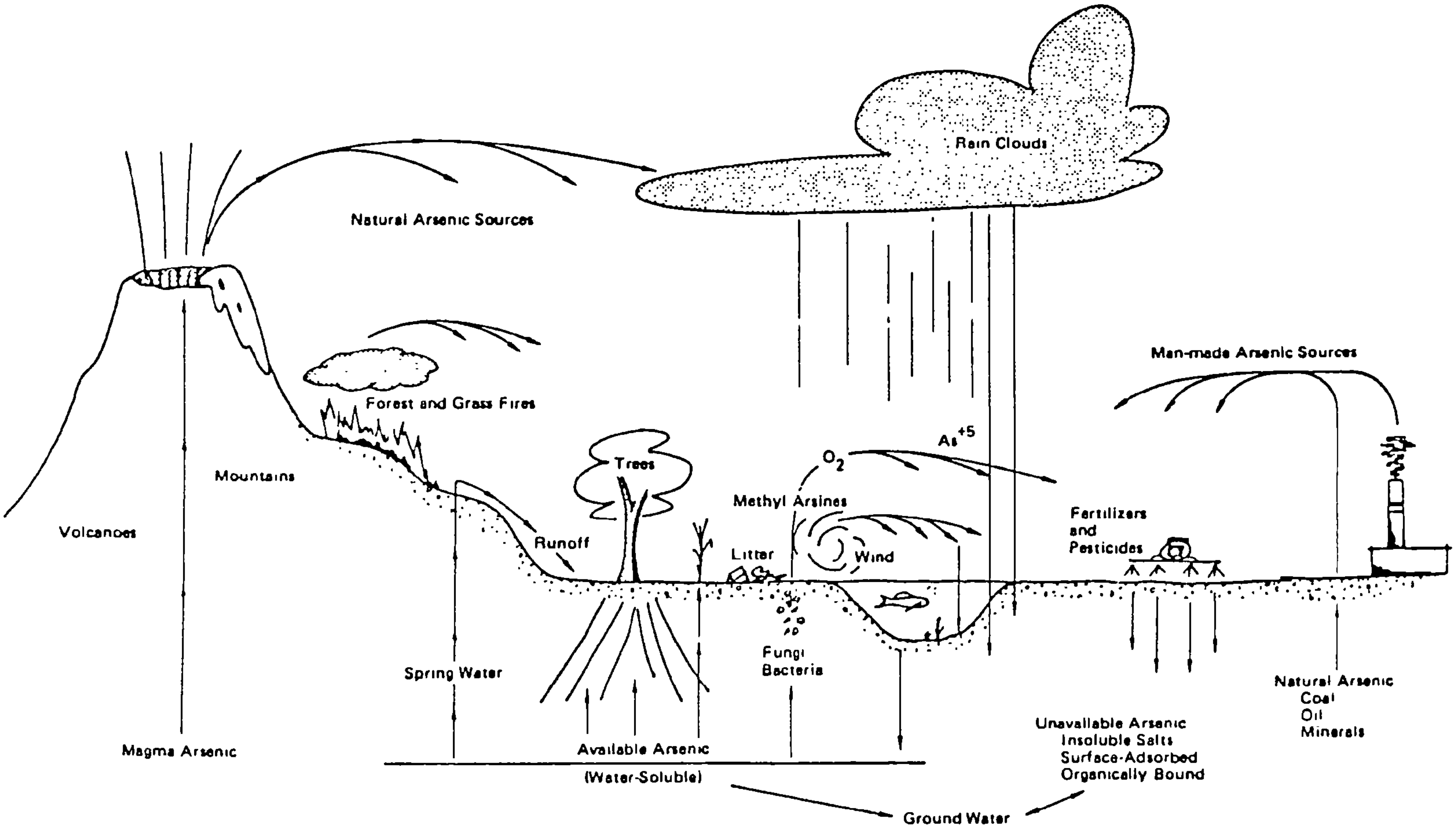


Figure 3-4. Environmental transfer of arsenic.

TABLE 3-20

Estimated Industrial Materials Balance for Arsenic, 1968[a]

Item	Arsenic, tons				
	Input	Atmospheric Emission	Solid Waste	Intermediate Product	Commercial Product
Coal consumption	4,300	800	3,500	0	0
Fuel-oil consumption	20	20	0	0	0
Nonferrous metal production:					
Mining and milling	43,100	300	28,000	14,800[b]	0
Smelting and refining	14,800[b]	2,500	2,000	0	10,300[c]
Total	---	3,620	33,500	---	10,300[c]

[a]Calculated on the basis of Davis and Associates, 1968,[170] Minerals Yearbook 1972, and Minerals in the U. S. Economy, 1975.[723a]

[b]Includes arsenic in imported concentrations and intermediate smelter products.

[c]From Minerals in the U. S. Economy, Bureau of Mines, 1975.[723a]

Table 3-21. Summary of U.S. Arsenic Flow, Dissipation, and Emission, 1974[a]

Location of Arsenic	Arsenic Flow, tons		Ready Environmental Transport
End products:	26,438		
Steel		17,089	No
Cast iron		3,638	No
Other		5,711	No
Dissipation to land:	63,030		
Steel slag		39,690	Unknown
Pesticides		11,565	Yes
Copper leach liquor		9,702	Yes
Other		2,073	
Airborne emissions:	9,757		
Losses from copper smelting		5,292	Yes
Pesticides		2,536	Yes
Coal		717	Yes
Other		1,212	Yes
Waterborne effluent:	165		
Phosphate detergents		121	Yes
Other		44	Yes
Landfill wastes:	19,691		
Copper flue dusts		10,584	No
Copper-smelting slag		3,748	No
Coal fly ash		1,984	No
Other		3,375	No

[a] Derived from Carton.[703a]

into the Sound.[161a] The installation of more pollution control equipment at this smelter is planned, so the amount of arsenic released into the air and water will decrease significantly.[161a]

Information has been collected, to the extent available, to develop a pattern of arsenic emission into the environment. It included information on the arsenic associated with mineral raw materials and fuels, on the arsenic content of salable mineral products, on solid waste discarded by mineral processors, and on effluents from mineral plants. Complete material balance reports were obtainable for only a few plants. However, considerable incomplete evidence was accumulated. These data were used to trace the disposition of arsenic--through mineral processing steps and consumption--in commodities containing significant quantities of arsenic. They were also used to determine the distribution of arsenic throughout commercial production and the disposition of arsenic used in agriculture and industry. Arsenic emission to the atmosphere was calculated with the factors listed in Table 3-19.

TABLE 3-19

Arsenic Emission Factors[a]

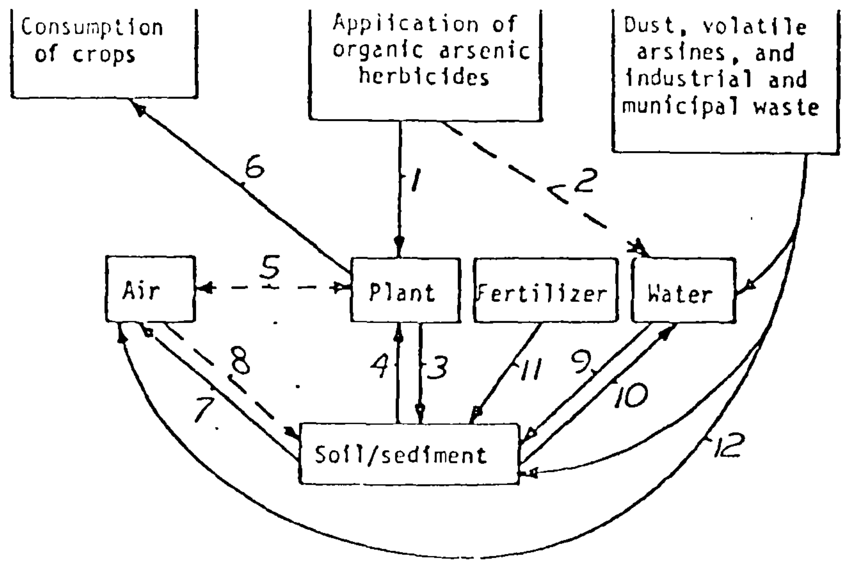
Arsenic Source	Arsenic Concentration
Mining and milling	0.45 ton/million tons of copper, lead, zinc, silver, gold, or uranium ore
Smelting and refining	955 tons/million tons of copper produced 591 tons/million tons of zinc produced 364 tons/million tons of lead produced
Coal	1.4 tons/million tons of coal burned
Petroleum	11.5 lb/million barrels of petroleum

[a]Calculated on the basis of Davis and Associates[170] and Minerals Yearbook 1968.[723]

TABLE 3-18

Method of Disposal of Principal Arsenic Compounds Manufactured in the United States

Compound	Current Disposal System
Arsenic trioxide	1. Entrapment of smelter flue dust and shipment to ASARCO for arsenic trioxide recovery
	2. Long-term storage
Cacodylic acid	1. Concrete storage vaults (currently contain 60,000,000 lb with 1-1.5% cacodylate)
	2. Recycling and reuse
	3. Landfill in class 1 sites
DSMA and MSMA	1. Recycling and reuse
	2. Long-term storage
	3. Landfill in class 1 sites
Calcium arsenate	Same as for DSMA
Lead arsenate	Same as for DSMA, plus recovery of metals by ASARCO
Copper acetoarsenite	Same as for DSMA, plus recovery of metals by ASARCO
Sodium arsenite	Same as for DSMA



Arsenical Pesticides

FIGURE 3-3. A proposed model for the arsenic cycle in an agronomic ecosystem. (Reprinted from Sandberg and Allen.[624]) (Dotted lines indicate minor or negligible transfers.)

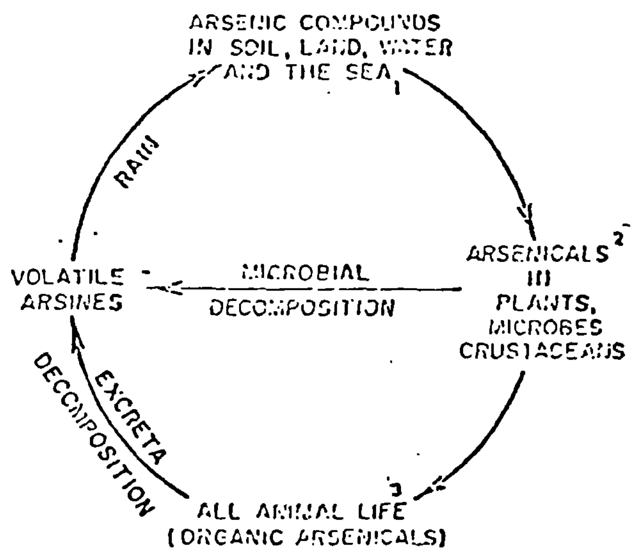


FIGURE 3-2. A proposed arsenic cycle. 1) the cycle in nature involves organic arsenicals, few identified. 2) marine algae may contain arsenic at up to 9 ppm, land plants generally at less than 0.5 ppm. 3) edible tissues of food animals contain, on average, below 0.5 ppm; fish, 0.5-3 ppm; and crustaceans, 3-100 ppm. (Reprinted with permission from Frost.)[235]

Table 6-5[a]

Observed Deaths and Standardized Mortality Ratios (SMR) at Ages 65 and Over for the Period January 1, 1949, through December 31, 1973, among 530 Men Retiring from the Tacoma Smelter, by Cause of Death and Arsenic Exposure Index at Retirement[b]

Cause of Death[d] (7th Revision)	Arsenic Exposure Index[c] Total		Under 3,000		3,000-5,999		6,000-8,999		9,000-11,999		12,000+	
	Obs	SMR	Obs	SMR	Obs	SMR	Obs	SMR	Obs	SMR	Obs	SMR
All causes	324	111.1[e]	87	98.1	124	110.3	70	129.2[e]	24	117.7	17	130.0
Cancer (140-205)	69	146.6[e]	15	107.9	28	156.0[e]	14	151.6	7	218.7	5	217.2
Digestive (150-159)	20	120.3	6	121.2	9	140.4	2	62.7	3	264.7	0	0.0
Respiratory (160-164)	32	300.3[e]	5	165.6	11	279.4[e]	7	306.9[e]	4	568.5[e]	5	810.5[e]
Lymphatic (200-203, 205)	2	94.9	1	166.1	1	126.1	0	0.0	0	0.0	0	0.0
Other cancer	15	84.8	3	56.3	7	102.8	5	150.4	0	0.0	0	0.0
Stroke (330-334)	44	114.7	18	150.3	12	80.0	7	104.5	6	218.4	1	64.7
Heart disease (400-443)	144	107.7	33	81.4	63	122.4	36	144.2[e]	5	53.6	5	83.2
Coronary (420)	118	105.9	25	74.9	52	122.2	31	145.1[e]	4	51.7	5	95.5
Other heart	26	116.6	8	111.5	11	123.2	5	138.4	1	62.9	0	0.0
Respiratory disease (480-493, 500-502)	10	91.6	4	116.8	3	70.9	1	52.4	2	250.8	0	0.0
All other causes	57	91.2	17	89.2	18	74.8	12	104.1	4	91.3	6	212.4

a Pinto, S. S., V. Henderson, and P. Enterline. Mortality experience of arsenic exposed workers. Unpublished data.

b Expected deaths were estimated on the basis of Washington State experience, 1949-1970. Includes four men with unknown exposures.

c Arsenic exposure index derived from Baetjer, A., M. Levin, and A. Lilienfeld. Analysis of mortality experience of Allied Chemical plant. Unpublished data.

d Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death.[780b]

e Statistically significant ($P < 0.05$).

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL Benzene

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
Petroleum Refineries: Colorado - 5 Montana - 8 Utah - 9 North Dakota - 3 South Dakota - 0 Wyoming - 17	Urban/Rural	3,000 ppm - endurable for 30-60 minutes. 7,500 ppm - dangerous after 30-60 minutes (acute poisoning symptoms) 20,000 ppm - fatal after 5-10 minutes	Air - hydrocarbon emissons	Scrubbers	OSHA - Occupational exposure set at 10 ppm TWA of 8 hours NIOSH - occupational exposure not greater than 10 ppm of air determined as a TWA exposure for up to 10 hr workday/40 hr. workweek with ceiling of 25 ppm	1) Multi-media sampling of all major sources Benefit - Determine the level of benzene being emitted from these sources. 2) Sampling of the neighborhoods surrounding the major sources Benefit - Determine the level of benzene present in these areas.
Coking Plants: Colorado Fuel and Iron Corp., Pueblo Colorado U.S. Steel Corporation, Orem, Utah	Urban/pop. 97,453 Urban/ pop. 25,729	Acute: produces toxic effects on the central nervous system Chronic: marked changes in the blood, chromosome alterations with diagnosis of leukemia.	Air - hydrocarbon emissons	For coke ovens - steam ejector lids double gas off-take relief piping to alleviate possible internal pressures	EPA - no ambient air quality standards but it is listed as a hazardous pollutant under the Clean Air Act. **	3) Survey local health effects of the neighborhoods surrounding the major sources Benefit - Determine if there are any chronic health effects in these areas relating to benzene.
Gasoline Industry: Terminals Bulk Plants Gas Stations Autos Terminals 0.4-6.8% benzene by volume resulted in environmental benzene concentration of 0.1 - 7.7 ppm Loading Trucks - 10-33% benzene by volume produced airborne concentration of benzene of 1.4-9.4 ppm Gas Stations - 2.8-5.8% benzene by volume resulted in environmental benzene of 0.2-3.2 ppm	Urban/Rural		Air, Water	Floating roof tank or fixed roof tanks Vapor recovery units	EPA - no effluent limitations EPA-no standard set under the Safe Drinking Water Act but it is designated as a hazardous substance under FWPCA OSHA & EPA are coordinating health research on the use of benzene in gasoline Draft NESHAPS on Benzene Emissons from gasoline industries	**Tentative Schedule for EPA to promulgate first set of benzene regulations is for Fall '79'
Solvent Refineries Big West Refinery, Kevin, Mt.	Urban/Rural		Air		EPA-HQ - had a meeting on Review of Draft Phase I Report on Benzene (benzene in gasoline) (The group recommended further literature review on its health effects, environmental fate & environmental impact as weel as a closer look at the other components of gasoline - it is presently unclear whether it is better to control benzene in gasoline or gasoline itself)	
Oil Spills - benzene content in crude oil varies from 0.001% to 0.4%			Water			

BENZENE

Major Sources

Two major sources of benzene, which produce benzene as a by-product, are the petroleum refineries (94%) and the coke oven industries (6%). There is no information available on the amount of benzene that is emitted into the atmosphere from petroleum refineries but it is thought to be a considerable amount. Attachment 1 is a list of all the petroleum refineries in Region VIII. For the coke industries each ton of coke produced, a yield of 3.2 gallons of light oil is realized of which 1.85 gallons are benzene. Emissons of benzene from the coke ovens are not known. Emissions of hydrocarbons calculated as methane for coke ovens with no emission controls are estimated at 1.96 lbs. of benzene emitted into the atmosphere for each ton of coke produced.

Major Uses of benzene are as a solvent (mainly in chemical labs), gasoline additive, and in the petrochemical industries (86%). Benzene is also found in printing and lithograph, paint, rubber products, dry cleaning, adhesives, detergents, oil and gas wells, transportation companies.

Benzene in Air

OSHA in 1974, analyzed 269 industrial atmospheric samples for the presence of benzene. The expected concentration of benzene in urban air is reported to be 0.01 to 0.05 ppm. Based on vapor pressure and chemical stability benzene is quite mobile and persistent. Its persistence suggests that it degrades slowly.

Benzene in Gasoline

The current national average of benzene content in gasoline is 1.3 liquid volume percent. There is 0.008 gram of benzene being emitted with every gram of hydrocarbon.

Bulk Terminals - benzene test data indicate that outlet emissions are in the range of 0.003 to 0.33 mg/L of gasoline loaded. Usually, bulk terminals have a storage capacity of 2.1 million gallons of gasoline.

Storage Tanks - losses of benzene are relatively small, approximately 20 kg/year.

Tank Trucks - losses of benzene are approximately 1300 kg/year.

Autos and Gas - this emission data is difficult to estimate. In urban environment approximately 20% of hydrocarbon emissions (terms of grams per vehicle mile for passenger vehicles) are due to evaporation. Benzene found in gasoline is; regular 1.35% by wt., premium 0.81% by wt., unleaded - no figures available. It is assumed that benzene is 1% of gasoline vapors and gasoline vapors are 20% of the total annual motor vehicle emissions.

Controls can be applied to bulk terminals, bulk plants, and service stations which would reduce benzene significantly. All service stations in Denver have vapor recovery units which are used to reduce benzene emissions. There is a 2 phase plan to reduce benzene emissons from these sources but it is in a stage of political standstill.

Health Effects

Acute: Exposure to massive concentration in the region of 2.5% by volume in air is rapidly fatal. The symptoms are those of central nervous depression which may be preceded by convulsion and death usually follows from cardiovascular collapse. Severe non-fatal symptoms are similar but recovery may come after a period of unconsciousness. Mild exposure symptoms show euphoria followed by giddiness, headache, nausea, staggering gait and unconsciousness if exposure continues. The severity of symptoms of acute benzene toxicity depends upon the concentration and duration of exposure, but it is documented that marked variations exist in individual susceptibility.

Chronic: The signs of chronic benzene exposure can appear any time from a few weeks to several years of exposure. Symptoms may be headache, dizziness, nausea, vertigo at the end of the work day, stomach pain, loss of appetite, feeling cold. With severe exposure clinical signs are more pronounced; i.e., decrease in red blood cells with a fall in hemoglobin level, indicating a form of anemia. With repeated exposures to benzene recurrences may readily appear and be more severe. Chromosone alterations have been reported in patients with a history of benzene exposure followed by diagnosis of leukemia.

Attachment 2 is a chart of exposures levels to benzene for humans, animals, and aquatic life.

Summary

Benzene studies to date have been in the range of 50 ppm to 100 ppm. Conclusions from these studies have shown that the unique aspect of chronic benzene poisoning effects the blood forming system. Also, because of the lack of data evidence that chronic exposure to benzene produces leukemia in humans is incomplete but sufficient enough to command serious consideration.

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PETROLEUM REFINERIES

Colorado

Asamera Oil (U.S.), Inc.	Commerce City	17,407
Continental Oil Co.	Commerce City	17,407
Gary Western Co.	Fruita	1,822
Morrison Refining Co.	Grand Junction	20,170
Williams Refining Co.	Denver	514,678

Montana

Big West Oil Co.	Kevin	-1,000
Cenex	Laurel	2,500-5,000
Continental Oil Co.	Billings	61,581
Exxon Co.	Billings	61,581
Kenco Refining Inc.	Wolf Point	3,000
Phillips Petroleum Co.	Great Falls	60,091
Westco Refining Co.	Cut Bank	2,500-5,000

North Dakota

Amoco Oil Co.	Mandan	11,000
Northland Oil & Refining Co.	Dickinson	12,400
Westland Oil Co.	Williston	11,280

Utah

Amoco Oil Co.	Salt Lake City	175,885
Caribou Four Corners, Inc.	Woods Cross	3,124
Chevron U.S.A.	Salt Lake City	175,885
Husky Oil Co.	North Salt Lake	2,143
Morrison Petroleum Co.	Woods Cross	3,124
Phillips Petroleum Co.	Woods Cross	3,124
Plateau, Inc.	Roosevelt	2,005
Western Refining Co., Inc.	Woods Cross	3,124
Phillips Petroleum Co.	Salt Lake City	175,885

Wyoming

Amoco Oil Co.	Casper	39,500
C&H Refinery, Inc.	Lusk	1,000
Glacier Park Co.	Osage	350

Wyoming

Glenrock Refining Co.	Glen Rock	1,515
Husky Oil Co.	Cheyenne	43,000
Husky Oil Co.	Cody	5,161
Little America Refining Co.	Casper	39,500
Mountaineer Refining Co. Inc.	LaBarge	204
Sage Creek Refining Co.	Cowley	366
Sinclair Oil Corp.	Sinclair	445
Southwestern Refining Co., Inc.	LaBarge	204
Texaco, Inc.	Casper	39,500
Wyoming Refining Co.	Newcastle	3,432

ATTACHMENT 1

ATTACHMENT 2

Organism	Mode of Exposure	Concentration of Exposure (ppm)	Duration of Exposure	Effect	Reference
Human	Oral	--	Acute	Death	25, 26
	Oral	--	Acute	Mucous membrane irritation and systemic intoxication	
	Dermal	Immersion of tissue	Acute	Erythema, skin defatting, dry scaling, secondary infections	27
	Inhalation	20,000	5-10 minutes	Convulsions, paralysis, coma, and death	23
	Inhalation	High	Acute	Petechial hemorrhage in body tissues, respiratory tract infections, hypoplasia and hyperplasia in sternal bone marrow, kidney congestion, and cerebral edema, death	27, 34-36
	Inhalation	Sublethal	Chronic	Insomnia, agitation, headache, dizziness, drowsiness, breathlessness, unsteadiness, irritability, vertigo, nausea, loss of appetite.	23, 27, 37
	Inhalation	2.8 mg/m^3 (0.875 ppm) (odor threshold)	Acute	Brain electropotential enhancement	39
	Inhalation	Sublethal	Chronic	Anemia, thrombocytopenia, thrombocytopathy, leukopenia, low hemoglobin concentration, increased cell size, eosinophil count elevation.	35, 36, 42
	Inhalation	Sublethal	Chronic	Stable and unstable chromosome aberrations	45-47
	Inhalation	100 ppm	Chronic (work hours)	Leukopenia	60

TABLE III (CONTINUED)

Organism	Mode Exposure	Concentration of Exposure (ppm)	Duration of Exposure	Effect	Reference
Human	Inhalation	25 ppm	Chronic (work hours)	Lower hemoglobin levels, minor hematological deviations.	61
Dog	Inhalation	Sublethal	Acute	Hypertension and vasomotor paralysis	73
	Oral	Sublethal	Acute	Mucous membrane irritation, pulmonary edema and hemorrhage	73
Rat	Inhalation	20 ppm	6 hours/day 6 days/week 5 1/2 months	Delay in conditioned response time	81
	Inhalation	100 ppm	6 hours/day 5 days	Decreased incidence of spontaneous behavior	82
	Inhalation	450-500 ppm	5 hours/day 10 days	Increase in cytochrome P450 and aminopyrine demethylase activity	85
	Inhalation	Threshold	Acute	Disturbed oxidation-reduction and albumin production	79
(pregnant)	Inhalation	1-63.5 mg/m^3 (0.3125-19.84 ppm)	Chronic	Significant biochemical alterations in both pregnant female and fetus	87
	Oral	0.93 (0.71-1.23 g/kg)	Acute	LD_{50}	67
(young adult)	Oral	3.4 g/kg	Acute	LD_{50}	67
(older adult)	Oral	4.9 g/kg	Acute	LD_{50}	67

Organism	Mode of Exposure	Concentration of Exposure (ppm)	Duration of Exposure	Effect	Reference
Rat (older adult)	Oral	5.6 g/kg	Acute	LD_{50}	67
	Inhalation	44 ppm	7 hours/day 5 days/week	Leukopenia	72
	Inhalation	200 ppm	8 hours/day 5 days/week 90 days	Leukopenia	74
	Inhalation	1000 ppm	23.5 hours/day, 105 hours	Body weight loss, nose and mouth hemorrhage, stomach distention, engorged blood vessels, reversal of polymorphonuclear: lymphocyte ratio	73
	Inhalation	88 ppm	204 days	Blood, bone marrow, spleen, and testes histopathological alterations	73
	Inhalation	40,000 ppm	20-35 minutes 5 exposures	3/8 male Long Evans rats died.	70
	Inhalation	10,000 ppm	12.5-30 minutes 1-17 days	2/10 male Long Evans rats died	70
	Inhalation	44 ppm	5 hours/day 4/days/wk 5-7 weeks	Slight leukopenia	72
Guinea pig	Inhalation	88 ppm	269 days	Blood, bone marrow, spleen, and testes histopathological alterations	73

TABLE III (CONCLUDED)

Organism	Mode of Exposure	Concentration of Exposure (ppm)	Duration of Exposure		Reference
Rabbit	Inhalation	80 ppm	243 days	Leukopenia and degeneration of seminiferous tubules	73
	Inhalation	35,000-45,000 ppm	3.7 minutes	Lightly anesthetized	75
	Inhalation	35,000-45,000 ppm	5 minutes	Excitation and tremors	75
	Inhalation	35,000-45,000 ppm	36 minutes	Death	75
	Inhalation	Sublethal	Chronic	Fatty bone marrow tissue, nucleic acid per unit weight of tissue decreased, synthesis of RNA and DNA increased	80
	Inhalation	10 mg/l (3,125 ppm)	6 hours/day 14 days	Hypertrophy of smooth endoplasmic reticulum ribosome loss, disappearance of segmental distention of ergastoplasm, swelling and myelin degeneration of mitochondria	86
	Inhalation	Sufficient to induce leukopenia		Reduced resistance to pneumonia and tuberculosis	88, 89, 91
	Injection	Sufficient to induce leukopenia		Active acute infections	90
	Inhalation	0.05 mg/l (15.625 ppm)	Chronic	Decreased phagocytic index and phagocytic number	92

TABLE IV

REPORTED ACUTE BENZENE TOXICITY TO AQUATIC ANIMALS

ORGANISM	Concentration (ppm) resulting in death of all organisms within					Reference
	2 Hours	24 Hours	24 Hours	48 Hours	96 Hours	
<u>Pimphales promelas</u> (fathead minnow)	--	--	35.56	35.08	33.47	115
<u>Lepomis macrochirus</u> (bluegill)	--	--	22.49	22.49	22.49	115
<u>Carassium auritus</u> (goldfish)	--	--	34.42	34.42	34.42	115
<u>Lebistes reticulatus</u> (guppies)	--	--	36.60	35.60	36.60	115
<u>Lepomis machrochiumus</u> (bluegill)	60	34	--	--	--	114

Source: Modified from <u>Assessing Potential Ocean Pollutants</u>, National Academy of Sciences, Washington, D.C. 1975.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: CADMIUM

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
1. ZINC ORE MINING 11 SOURCES	RURAL	CHRONIC TOXICITY WHEN INGESTED IN QUANTITIES ONLY 3 TO 13 TIMES GREATER THAN PRESENT AVERAGE INTAKE RATES. CAN CAUSE EMPHYSEMA, BRONCHITIS, KIDNEY DAMAGE HEART, LIVER DAMAGE. SUSPECT CARCINOGEN CORRELATION WITH ARTERIOSCLEROTIC HEART DISEASE, HIGH BLOOD PRESSURE, AND DECREASED LIFE EXPECTANCY. CHRONIC HIGH EXPOSURES CAN RESULT IN LIVER AND LUNG DAMAGE, DEGENERATIVE BONE DISEASE AND DEATH.	WATER	AIR - ELECTROSTATIC PRECIPITATORS, BAGHOUSES, CYCLONES	EPA	
2. ZINC EXTRACTION REFINING + PRODUCTION 2 SOURCES	URBAN		AIR	WATER - PRECIPITATION ION EXCHANGE SETTLING PONDS, THICKNERS. FILTERING, CENTRIFUGING	EPA	
3. ELECTROPLATING SHOPS 37 SOURCES	URBAN + RURAL		WATER, SOLID WASTE		EPA	
4. PIGMENT MANUFACTURE NONE	—		WATER			
5. STABILIZER MANUFACTURE NONE	—		WATER	SOLID WASTE - COAGULATION WITH LIME, SEDIMENTATION, FOLLOWED BY SAND FILTRATION. ION EXCHANGE FOR EFFLUENT. THEN TO ALLIANCE CHEM. LANDFILL.		
6. ALLOY MANUFACTURE NONE	—		WATER, AIR			
7. BATTERY MANUFACTURE ~~NONE~~ 1 SOURCE - COLO SPRINGS	- URBAN		WATER, SOLID WASTE			
8. SECONDARY NONFERROUS METALS 16 SOURCES	URBAN + RURAL		AIR + WATER SOLID WASTE		EPA	
9. IRON + STEEL INDUSTRY 2 SOURCES	URBAN		AIR		EPA	
10. GALVANIZED PRODUCTS NONE	—		WATER, SOLID WASTE			
11. RUBBER TIRE WEAR UNKNOWN	—		AIR			
12. INCINERATION UNKNOWN	—		AIR			
13. COAL COMBUSTION (POWER PLANTS) 63 SOURCES (PROPOSED + EXISTING)			AIR, SOLID WASTE		EPA	
14. DIESEL + FUEL OIL COMBUSTION UNKNOWN	URBAN		AIR			
15. LUBRICATING OIL UNKNOWN	URBAN		WATER, SOLID WASTE			
16. SEWAGE SLUDGE 1,153 SOURCES	URBAN + RURAL		SOLID WASTE		EPA	

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: CADMIUM

Major Sources

Cadmium is found in nature most generally in low concentrations associated with a similar metal, zinc. It is present as an impurity in the more common galvanized zinc coatings (0.03%) and is also used in many other everyday items such as pottery pigments, paint and plastics. Automobile tires also contain cadmium which is introduced as an impurity in the zinc used in the production of tires. Cadmium is a by-product of zinc smelting and to a lesser extent, cadmium can be recovered from lead and copper ores.

In Region VIII the summary of sources was obtained from literature detailing the mining industry and our NPDES files. There are 11 sources involved in zinc ore mining with two sources extracting, refining and producing zinc. There are approximately 37 shops in the Region doing electroplating and could be sources of cadmium. With many power plants switching to coal, there are a total of 63 potential sources. This includes existing and proposed coal burning power plants. There are approximately 18 potential sources of cadmium from the secondary non-ferrous metals and the iron and steel industry.

The amount of cadmium introduced into the environment in Region VIII through tire wear is unknown. There are approximately 1153 sewage treatment plants in the Region, many of which may have cadmium present in sludge.

Population At Risk/Environmental Exposure

The range of exposure to potential sources runs from rural areas to urban environments.

Health and Environmental Effects

Health problems from cadmium became known when it was identified as the probable cause of Itai Itai disease in Northern Japan. The deaths and deformities experienced by over 200 people in Northern Japan have been attributed to cadmium from mining wastes which polluted the water supply, resulting in contamination of food-growing areas.

Cadmium has unquestioned chronic toxicity leading to serious pathological consequences when ingested in quantities only 3 to 13 times greater than present average intake rates. Cadmium and its compounds are toxic substances by all means of administration.

Inhalation of cadmium fumes, oxides and salts often produces emphysema, which may be followed by bronchitis. Prolonged exposures to air-borne cadmium frequently cause kidney damage resulting in proteinuria. Cadmium also affects the heart and liver.

Cadmium may also be a carcinogen. While there is little evidence to support this conclusion from studies of industrial workers, animal experiments have shown cadmium to be carcinogenic.

There is also concern since a statistical study of cadmium in the air of U.S. cities showed a correlation between cadmium levels and increased arteriosclerosis heart disease, high blood pressure and decreased life expectancy.

Entry Into The Environment

We ingest cadmium from a number of sources; air, food, and tobacco. Cadmium is carried through water onto the land and taken up in the food we eat.

Control Mechanisms Available

Electrostatic precipitators, baghouses, and cyclones are effectively used for abatement of air pollution. From combustion sources, a removal efficiency of 97 to 99 percent is indicated.

In water, if cadmium is present in the form of suspended particulates, the discharge can be controlled by using settling ponds or thickeners. Filtering or centrifuging wastes can also be considered.

If cadmium is present as a soluble compound, it can be removed by precipitation, or using the techniques of ion exchange, solvent extraction, or electrolytic deposition.

The only adequate method for disposal of concentrated cadmium wastes is coagulation with lime; then sedimentation followed by sand filtration. The effluent from this process should be treated further to reduce the cadmium concentration to an acceptable level.

Current Agency and Other Efforts

EPA has addressed cadmium in its effluent guidelines only for the mining industry. Several guidelines are given in EPA's Quality Criteria for Water. There is also a drinking water standard.

The folliwing schedule is in place:

Fall 78	- EPA/FDA/CPSC Statement on Cadmium and other heavy metals leached from decorated glassware.
10/8/78	- FR Notice on EPA air programs decision
12/78	- FR Notice on proposed OSHA decision
Spring 1979	- Final decision on cadmium RPAR.

Cost/Benefit

The benefits are health related and therefore difficult to quantify.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL Inorganic Lead (Pb)

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
Lead production in Region 8 = 33,840 short tons, approx. 5% of U.S. total (1977). Co-produced with gold, silver and zinc Major production in: Colorado 22,994 short tons N. Dakota None S. Dakota None Montana 106 short tons Utah 10,740 short tons Wyoming None Smelters. American Smelting and Refining Co., East Helena, MT Miscellaneous Emissions Automobile = 300,000 tons/yr (1970) Lead Emission Factors: Mining and milling 0.2 lb/ton lead mined Primary lead production 5 0 lb/ton of product Primary copper production 0.6 lb/ton of product Grey iron foundries 0.3 lb/ton of iron	mostly rural environment pop. 10,000 all urban populations	Low level (chronic) lead exposure can cause central nervous system disorder. High level (acute) exposure can cause brain damage. Fish Toxicity- Acute- Hard Water. Total Lead-471 mg/l-96hr LC_{50} Free Lead - 1.38mg/l -96hrLC_{50} Soft Water Free Lead- 0.14mg/l-18dayLC_{50} Chronic Hard Water Total Lead - 3.24 mg/l Free Lead - 0.064mg/l Soft Water- Free Lead 0.028mg/l	Air-stack emission Water-acid mine drainage Tailing ponds Land- stack emission Fallout from auto emission	Mines: Federal metal and non-metal mine safety Act Air: Clean Air Act 1970 1.5ug/cu m Water: discharge permits - not to exceed 0.06mg/l Drinking Water Act - 0.05 mg/l OSHA 0.1mg/cu m	IRLG agencies are participating in developing an air pollution control standard for lead. These agencies are considering a joint assessment both of lead exposure and economic impact of multi regulatory action.	(1) Multimedia inspection of Major producers. (2) Check community for visible damage and health effects Benefits from resource allocation (1) Better background information for future studies. (2) To insure that pollution abatement is working and futher environmental degradation is slowed.

LEAD

Lead emissions have been extensively studied over the past few years because of its chronic effects.

The emission to the air, excluding the automobile, is approximately 18,000 tons/yr for the United States, of which 5% is emitted in Region 8. To account for this amount: 18% is from burning waste oil; 13% is from municipal sewage incineration; 13% grey iron foundries; 11% from producing gasoline additives; 9% from production of primary lead smelting; 9% from copper smelting; and 8% from the production of steel.

The discharge of lead and its salts occurs mainly from the production of batteries and from acid mine drainage. These values range from 0 to 145 mg/l.

Annual consumption of lead is approximately one million tons and of this amount 20% is used in the production of gasoline. The annual emission of lead to the atmosphere is approximately 300,000 tons/yr. (1970).

This amount of emission to the atmosphere gives the average background of lead to be 0.6 micrograms per cubic meter (ug/m^3). The lead emitted into the atmosphere from automobiles is quickly diluted to about 22% of its initial value within 1300 ft. of the roadway. The half life of the lead aerosol is 3 hr. and when these break down they can contaminate both land and water directly. Two thirds of the lead emitted in the urban environment is in the form of soluble lead salts which go into the storm sewers and contaminate the (water directly ?). This amount is approximately 8,800 tons/yr.

Attached are some tables from the 1978 criteria document on exposure to inorganic lead which lists persons who are likely to be exposed; data of lead exposure in printing industry, battery manufacture, welding operations, and other occupational groups.

NIOSH

CRITERIA FOR A RECOMMENDED STANDARD....
OCCUPATIONAL EXPOSURE TO

INORGANIC LEAD
Revised Criteria - 1978

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

TABLE X-4

General Exposure from Operations Utilizing Lead

Operation	Incidence of Plumbism	Average Lead Concentrations Found: Air (mg/m3)		Urine (mg/l)	
		Avg	Max	Avg	Max
Metalizing	High				
Paint spraying: red lead	High	1.8	3.5		
Brush painting: red lead	Some			0.26	0.35
Paint sanding, scraping	High	0.32		0.30	0.48
Leaded iron pouring	High	19.5			
Bearing bronze pouring	Some	1.86	3.4	0.54	0.82
Bearing bronze grinding	Low	0.84		0.33	
Storage-battery manufacturing:					
Mixing	Some	0.73	3.8	0.70	1.00
Pasting	Some	0.75	2.1	0.26	0.48
Grouping	Some	0.50	4.0	0.22	0.68
Separating	Low	0.15	0.41	0.15	0.27
Casting	Low	0.26	0.65	0.19	0.31
Lead smelting, refining	Some	0.35	1.45	0.35	0.88
Lead burning	Some	0.57	1.5	0.26	0.37
Homogenizing	Some	3.0			
Painted-steel burning	Some			0.41	0.50
Lead powder mixing	Some	2.2	10.2	0.22	0.32
Lead sanding, grinding	Some	4.2	7.4	0.26	
Paint mixing	Low	1.75	5.8	0.17	0.29
Painting, N.O.C.	Low			0.09	0.16
Paint spraying: chrome yellow	Low	3.9		0.10	
Wire patenting	Low	0.29	0.60	0.12	0.21
Steel tempering	Low	0.13	0.22	0.10	0.21
Bronze pouring	Low	0.34	1.56	0.20	0.34
Bronze grinding	Low	0.47	1.24	0.17	0.34
Lead casting	Low	0.12	0.35	0.14	0.37
Printing:					
Stereotyping	Low	0.26	0.51	0.15	0.22
Linotyping	None	0.07	0.24	0.08	0.14
Soldering, tinning	Low	0.25	0.62	0.15	0.23
Lead sawing	Low	0.25			
Lead glass working	Low	0.01	0.02	0.05	0.10
Gasoline-tank cleaning	Low			0.07	0.14

TABLE X-6

Representative Lead Exposures in the Printing Industry

Location	Nature of Operations or Exposure	Lead Concentration in mg/m^3 Max.	Min.	Ave.	Remarks
Linotype Room	Lead concentration about 12" above lead pot of one of centrally located machines	0.027	0.007	0.014	Pot temperature ranged from 515° to 550° F.
	Exposure of machine operators	0.020	0.006	0.012	
Monotype Room	Lead concentration about 12" above lead pot of one of centrally located machines	0.570	0.056	0.163	Pot temperature ranged from 660° to 835° F.
	Exposure of machine operators	0.096	0.027	0.056	
Remelt Room	Average room concentration	0.158	0.004	0.041	Melt kettles enclosed are exhaust ventilated
	Workers' exposure while filling molds	0.132	0.035	0.073	Worker's face about 18 to 24[11] above molds while being poured. Lead temperature 600° to 700° F.
	Room concentration while drossing kettles and while removing copper plates from electrotype	0.257	0.149	0.196	Several kettles drossed during sample but only one kettle door open at a time
Composing Room	Average room concentration	0.118	0.016	0.062	
Stereotype Room	Concentration at or near the breathing level of workers operating lead pots, pouring molds, etc.	0.026	0.003	0.008	Pot temperature ranged from 550° to 600° F.
	Exposure of operators of trimming and finishing machines such as saws, bevelers, planers and routers	0.442	0.002	0.104	

Adapted from reference [53]

TABLE X-7

REPRESENTATIVE LEAD EXPOSURE IN PRINTING OPERATIONS

Description of Exposure	No. Of Samples	Range mg/m^3	Mean mg/m^3
Lead Concentrations over Linotype Melting Pots	9	< 0.01 - 0.054	0.029
Concentrations While Cleaning Linotype Plungers	6	0.06 - 2.8	0.783
Concentrations Around Metal Pots While Removing Dross	9	1.4 - 160.0	29.30
Atmospheric Lead at Breathing Zone of Linotype Operators	17	< 0.01 - 0.049	0.021
Atmospheric Lead in Hand Composing Areas Adjacent to Linotypes	7	< 0.01 - 0.045	0.017
Lead in General Atmosphere of Monotype Rooms	12	< 0.01 - 0.060	0.028
Lead Concentration 6 inches Above Monotype Metal Pots	22	< 0.01 - 10.0	1.070
Lead Concentrations 19 inches Above Monotype Metal Pots	8	< 0.01 - 0.38	0.148
Atmospheric Lead in Vicinity of Unexhausted Remelt Furnace During Various Phases of Operation			
1. Loading & Heating	8	< 0.01 - 0.16	0.052
2. Cleaning & Drossing	7	5.10 - 50.0	15.26
3. Pouring	7	0.094 - 0.78	0.313
Atmospheric Lead in Vicinity of Exhausted Remelt Furnace During Various Phases of Operation			
1. Loading & Heating	2	0.881 - 0.15	0.116
2. Cleaning & Drossing	2	1.8 - 5.3	3.55
3. Pouring	2	0.053 - 0.15	0.102

Sampling - Electrostatic Precipitator
Analysis - Dithizone
Adapted from reference [54]

TABLE X-8

Representative Lead Exposure in the Printing Industry

	Years in Printing	Calculated Exposure mg/m^3	Urine Lead mg/liter
Linotype Operators			
	9	0.03	-
	16	0.03	0.11
	15	0.10	0.04
	6	0.02	-
	20	0.02	0.17
	15	0.02	0.11
	19	0.02	0.17
	38	0.02	-
	12	0.02	-
	22	0.02	-
	11	0.02	-
	40	0.09	0.16
	18	0.02	0.11
	3	0.02	0.32
	8	0.04	0.21
	6	0.02	0.19
	4	0.02	0.24
	15	0.10	0.28
	20	0.10	0.26
Monotype Operators			
	3	0.04	0.03
	10	0.09	0.28
	19	0.06	0.17
	7	0.04	0.10
	17	0.06	0.18
Remelt Men			
	2	0.38	0.17
	7	0.15	0.13
	1	0.04	0.28
	10	0.09	0.06
	3	0.50	-
	5	0.03	-
	9	0.13	0.19

TABLE X-8 Cont.

	Years in Printing	Calculated Exposure mg/m^3	Urine Lead mg/liter
Stereotypers			
	1	0.09	0.27
	10	0.10	0.17
	4	0.08	0.29
	1	0.10	0.26
Others			
	26	0.02	0.23
	1	0.03	0.36
	2	0.07	0.23
	6	0.02	-
	10	0.02	-

Sampling - Electrostatic Precipitator
Analysis - Dithizone

Adapted from Reference 55

TABLE X-10

Average and Median Blood Lead Content in mg/100 g of Blood in Storage-Battery Workers, by Exposure and Duration of Employment.

Duration of Lead Exposure, Years	Air Lead Content, mg/m^3				
	0-0.074	0.075-0.14	0.15-0.29	≥0.3	% >0.15
0-4					
Number	17	16	32	20	
Average	0.0187	0.0316	0.0378	0.0463	59
Median	0.021	0.030	0.038	0.050	
5-9					
Number	10	13	40	24	
Average	0.0278	0.0405	0.0501	0.0505	74
Median	0.033	0.040	0.043	0.050	
10-14					
Number	23	24	30	32	
Average	0.0198	0.0375	0.0502	0.0481	57
Median	0.018	0.038	0.046	0.048	
15+					
Number	44	30	59	45	
Average	0.0293	0.0407	0.0457	0.0493	58
Median	0.023	0.036	0.045	0.045	

Analysis - Dithizone

Adapted from references 4 and 11

TABLE X-11

REPRESENTATIVE LEAD EXPOSURES WHILE PERFORMING

WELDING OPERATIONS UNDER VARIOUS CONDITIONS

Coating	Type weld	Location of sampling probe	Lead	Avg.
POOR VENTILATION†		EXPERIMENTAL AREA	mg/m^3	
Zinc-silicate	Elect. arc	2' directly above welding	15.2	
" "	" "	3' above and 2-1/2 back of welding*	0.86	
" "	" "	3' above and 2' back of welding*	3.27	5.63
" "	" "	3' above and 2' back of welding*	3.65	
" "	" "	Attached to welder's shoulder*	5.16	
Zinc-silicate	Oxy-acetylene	1' above and 1' back of welding*	3.53	
" "	" "	3' above and 2-1/2' back of welding*	1.24	
" "	" "	3' above and 2-1/2 back of welding*	1.56	
" "	" "	3' above and 2' back of welding*	1.80	1.96
" "	" "	3' above and 2' back of welding*	1.80	
" "	" "	3' above and 2' back of welding*	1.76	
" "	" "	3' above and 2' back of welding*	2.00	
Galvanized steel	Elect. arc	2' above and 1' back of welding*	0.40	
" "	" "	2' above welder's face	0.69	
" "	" "	6' above floor, 5' in front of welder	0.35	0.52
" "	" "	Attached to welder's shoulders*	0.64	
Galvanized steel	Oxy-acetylene	2'above and 2' back of welding*	0.66	
" "	" "	3' above and 2-1/2' back of welding*	0.24	
" "	" "	2' above and 1' back of welding*	0.41	0.43
" "	" "	6' above and 5' back of welder	0.30	
" "	" "	3' above and 1' back of welding	0.55	

TABLE X-11 (CONTINUED)

Coating	Type weld	Location of sampling probe	Lead	Avg.
Clean steel	Elect. arc	2' above and 1' back of welding. (Control sample)	0	
" "	Oxy-acetylene	20' from welding enclosure (Room air. Control sample)	0	
" "	Elect. arc	20' from welding enclosure (Room air. Control sample)	0	
GOOD VENTILATION		(BREATHING ZONE SAMPLES)		
Zinc-silicate	Oxy-acetylene cutting	Attached near welder's nose**	0.18	
Zinc-silicate	Electric arc beading	Inserted in welder's hood**	0.08	
Zinc-silicate	Electric arc welding	Inserted in welder's hood**	0.14	
Galvanized steel	Oxy-acetylene cutting	Attached near nose**	0.01	
Galvanized steel	Electric arc welding	Inserted in welder's hood**	0.01	
ROOM AIR SAMPLES		(DOWNWIND FROM WELDER)		
Zinc-silicate	Elect. arc	3' downwind from the welder. 3' from floor	0.81	
" "	" "	3' downwind from the welder. 3' from floor	0.76	0.78
" "	" "	20' downwind from the welder. 3' from floor	0.26	
" "	" "	20' downwind from the welder. 3' from floor	0.24	0.25
" "	" "	20' downwind from the welder. 6' from floor	0.27	
" "	" "	20' downwind from the welder. 6' from floor	0.53	0.40

TABLE X-11 (CONTINUED)

Coating	Type weld	Location of sampling probe	Lead	Avg
OUTDOOR SAMPLES		(10 MPH WIND)		
Zinc-silicate	Elect. arc	Welder sat upwind. Probe inserted in hood.	0.06	
Galvanized steel	Elect. arc	Welder sat upwind. Probe inserted in hood.	0.01	
Galvanized steel	Oxy-acetylene (cutting)	Welder sat upwind. Probe was held 3" from nose.	0.00	

† Samples were not collected inside welder's hoods.
* Sample probe located near welder's face.
** Welder located upwind from welding.

Analysis - Dithizone
Adapted from Reference 56

TABLE X-12

Lead Exposures and Urinary Lead Levels from the Cutting of Painted Structural Steel

Exposures (Breathing Zone)		No.	Exposure mg/m^3	
		1	0.18	
		2	0.50	
		3	2.40	
		4	1.70	
		Avg.	1.20	

Urine-Lead	Respirator	Sp. Gr.	Mg. Lead/Liter Urine	
	Mech. Filter	1.014	0.06	
	Mech. Filter	1.025	0.34	
	Mech. Filter	1.026	0.30	
	Mech. Filter	1.030	0.53	
	Mech. Filter	1.016	0.36	
	Mech. Filter	1.020	0.58	Avg. 0.39
	Mech. Filter	1.034	0.28	
	Mech. Filter	1.025	0.70	
	Mech. Filter	1.031	0.50	
	Mech. Filter	1.020	0.49	
	Mech. Filter	1.030	0.33	
	Mech. Filter	1.020	0.26	
	Canister-Type	1.020	0.26	Avg. 0.25
	Canister-Type	1.030	0.24	

Adapted from Reference 57

TABLE X-13

DISTRIBUTION OF PERSONS IN VARIOUS OCCUPATIONAL GROUPS ACCORDING TO CONCENTRATIONS OF LEAD IN BLOOD-CINCINNATI

Lead in blood, mg/100g	Service station attend-ants 1956	Refinery handlers of gasoline 1956	Park-ing attend-ants 1956	Garage Me-chanics 1956	Drivers of cars 1956	Drivers of cars 1963	Police: Traffic officers 1956	Police: Traffic officers 1963	Police: All police* 1963	Fire-men 1963	Post-Office Emp. 1963	City Health Dept. Emp. 1963
0-0.009												
0.010-0.019	1	2				1		3	12	18	22	10
0.020-0.029	42	30	1	8	17	4	7	23	78	123	90	24
0.030-0.039	71	46	26	43	19	9	9	9	27	44	24	2
0.040-0.049	14	8	20	72	9		1	4	5	6	2	
0.050-0.059	2			25							1	
0.060-0.069			1	4				1	1		1	
Totals	130	86	48	152	45	14	17	40	123	191	140	36
Mean	0.028	0.027	0.034	0.038	0.033	0.031	0.031	0.030	0.025	0.025	0.023	0.021
Std. Dev.	0.007	0.006	0.006	0.009	0.006	0.006	0.006	0.009	0.007	0.006	0.007	0.005

*Includes traffic officers for 1963.

From reference [58]

TABLE X-14

DISTRIBUTION OF PERSONS IN VARIOUS OCCUPATIONAL GROUPS ACCORDING TO CONCENTRATIONS OF LEAD IN URINE-CINCINNATI

Lead in urine, mg/100g	Service station attend-ants 1956	Refinery handlers of gasoline 1956	Park-ing attend-ants 1956	Garage Me-chanics 1956	Drivers of cars 1956	Drivers of cars 1963	Police: Traffic officers 1956	Police: Traffic officers 1963	Police: All police* 1963	Fire-men 1963	Post-Office Emp. 1963	City Health Dept. Emp. 1963
0-0.009	1	1	1	4	1			2	2			
0.010-0.019		1	4	2	28		9		6	47	49	12
0.020-0.029	74	49	21	39	11	5	5	13	29	71	52	18
0.030-0.039	33	22	12	33	2	4		7	21	36	19	6
0.040-0.049	13	9	7	30	2	4	3	8	30	19	9	1
0.050-0.059	5		2	21		1		2	12	9	1	
0.060-0.069	3	4	1	16				1	7	2		
0.070-0.079				4	1			1	3	1		
0.08-0.12	1			3				3	6			
Totals	130	86	48	152	45	14	17	37	116	185	130	37
Mean	0.027	0.028	0.028	0.040	0.020	0.036	0.023	0.039	0.038	0.027	0.022	0.022
Std. Dev.	0.010	0.013	0.011	0.020	0.011	0.010	0.011	0.020	0.018	0.011	0.009	0.007

*Includes traffic officers for 1963.

From reference 58

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: Mercury (Inorganic) Hg

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
(1) Copper Smelting (a) Anaconda 1. Anaconda, MT - 8 kg/day 2 (b) Kennecott Copper Corp. Magna, UT - 8 kg/day (2) Commercial fossil fuel [redacted]-fired power plants (1973) (a) Colorado (41) 1.8×10^{-5} gm/kilowatt-hr (b) Montana (7) 2.3×10^{-5} gm/kilowatt-hr (c) Utah (21) 2.3×10^{-5} gm/kilowatt-hr (d) Wyoming (22) 3×10^{-5} gm/kilowatt-hr (e) N. Dakota (35) 3.3×10^{-5} gm/kilowatt-hr (f) S. Dakota (50) 2.9×10^{-4} gm/kilowatt-hr TOTAL = 1.2×10^{-4} gm/kilowatt-hr (3) Miscellaneous Emissions Past milling activity Primarly Gold and Silver ores Present Mining activites Coal	Large human population located near smelters: Anaconda, MT - pop. 10,000 Salt Lake City, UT - pop. 175,885	*Depending on form of mercury,* this metal can cause severe nervous system damage and kidney destruction. Fish Toxicity No clear data Problem occurs from fish because of biomagnification	*Copper smelting:* Air - 90% Water - 5% Solid waste - 5% Power plants: Air - 95% Water - 2.5% Solid waste - 2.5%	Ambient air quality standards promulgated 1971. Drinking water limit 2 ug/l. Waste water permits allow 2 ug/l. Solid wastes: mercury wastes not allowed to be dumped - recycled.	Clean Air Act 1970 F.I.F.R.A. 1972 Drinking Water Act 1974 OSHA standard: 50 ug/m^3 8 hr. T.W.A. F.I.F.R.A. 1972 cancelled all uses of Mercury as a pesticide except for the following. fungicide - textiles and fabrics for continous outdoor use , to control brown mold on freshly sa sawn lumber; to control Dutch elm disease, in water based paints for exterior use; to treat "summer turf diseases" and "winter Turf diseases" as a seed treatment and as an In-can preservative in water based paints and coatings.	Resource Allocation. (1) Multimedia inspection of each of the major producers (2) Inspection of the neighborhoods in the community for visible damage and health effects. Benefits from resource allocation: (1) Increased background knowledge of pollution levels of the major prouducers for future studies. (2) Increased knowledge of current pollution abatement equipment and to ascertain if environmental degradation is slowed. (3) To ascertain if any increase in mortality or increase in diseases related to mercury poisoning.

MERCURY

The toxicity of Mercury and its compounds has been recognized from historical times. However, recent evidence indicates the relative ease that these materials enter into the food chain of man when improperly discharged into the environment. The scarcity of reliable data about these materials in the environment makes it difficult to access whether mercury is building up in the environment.

Due to the physical nature of mercury, many diverse uses are made of it. These uses range from electrical switch manufacture, to battery manufacture, to laboratory use and to paint manufacture. Therefore, the sale of mercury is to industry as well as the individual consumer. This wide range of consumption creates special control problems, since there are many small losses by many users. These man-related emissions, which are out-weighed by natural emissions, are in highly populated areas, and a direct relationship can be shown between population and total mercury discharge. It has been found, that aside from industrial and mining applications, the estimated emission of mercury on a per capita basis are: air 1.80 g; water 0.39 g; and land 4.25 g.

Mercury has been the subject of many epidemiological studies. These studies indicatethat at levels below 0.01 mg Hg/cubic meter there is no apparent health hazard; that at levels between 0.01 and .27 mg Hg/cubic meter some signs of mercury poisoning appears and at levels above 0.3 mg Hg/cubic meter signs and symptoms of chronic Hg poisoning appear.

The attached appendix shows two primary air sources of mercury emissions; a typical copper smelter and a coal-fired power plant. The conclusion of the paper is that the emission of mercury from smelting and fossil fuel plants presents no apparent health hazard and no additional controls are necessary.

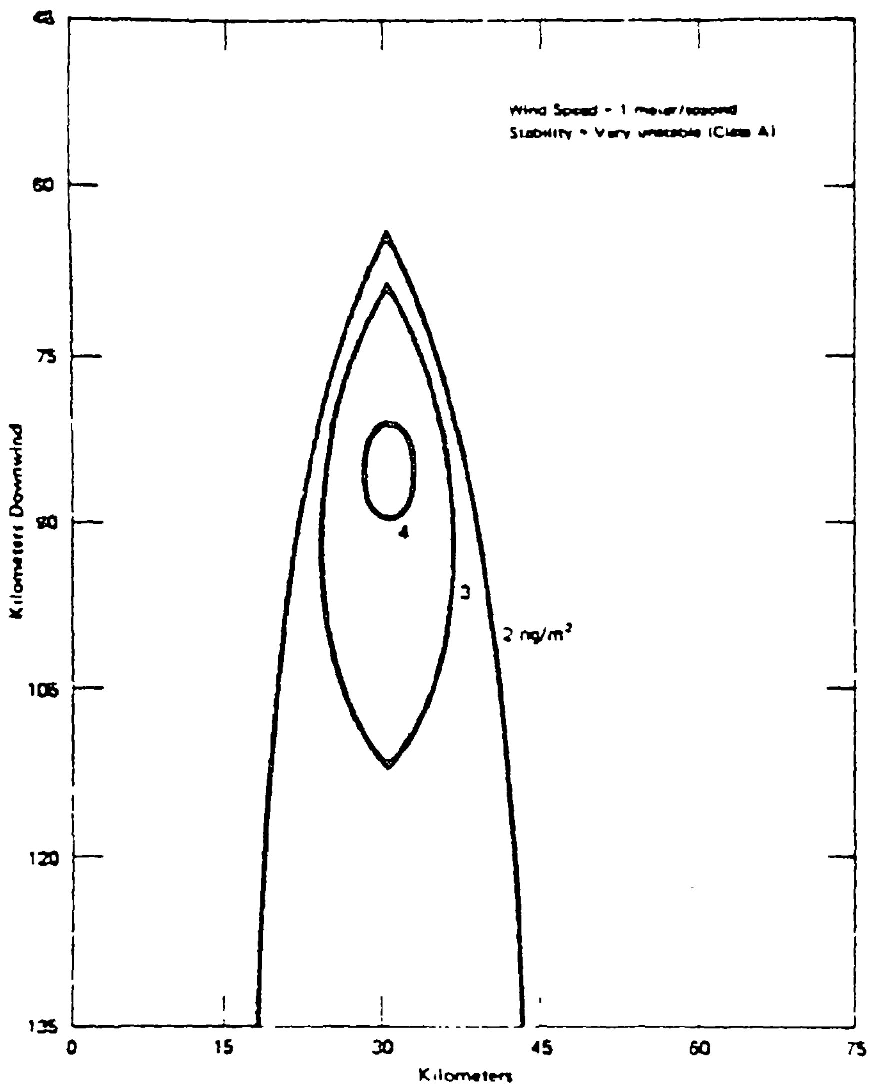
APPENDIX E

POINT SOURCE EMISSIONS OF MERCURY

Two primary sources of mercury vapor that enters the atmosphere are coal-fired power plants and copper smelters. Such sources may subsequently also contribute to relatively high ground level concentrations. With this in mind, dispersion analyses were performed for a large coal-burning power plant for which mercury emissions data were available, and for a copper smelter.

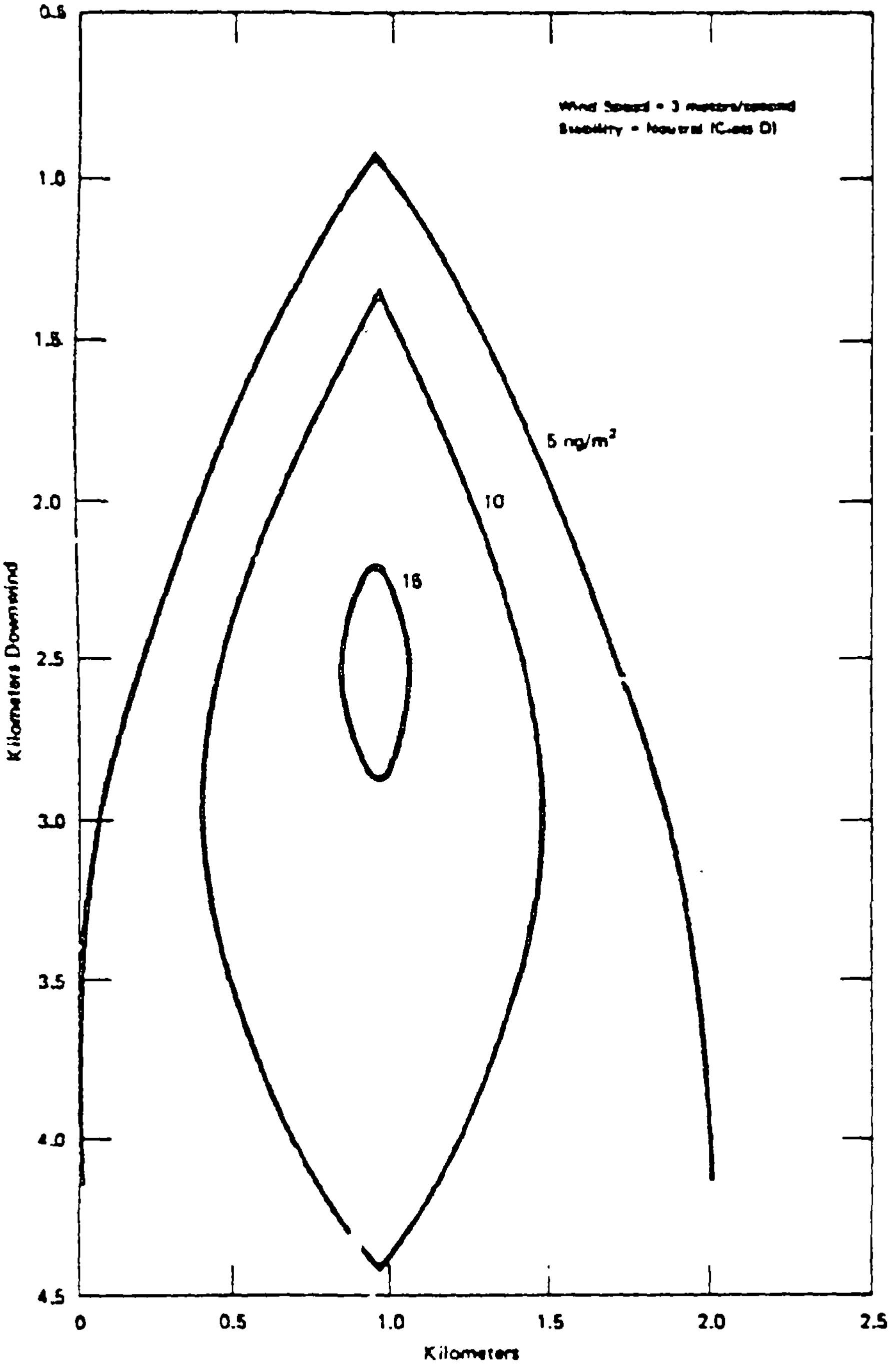
Figures E-1 through E-3 are isopleths of mercury vapor concentrations which result from a copper smelting operation in Arizona. Three cases were analyzed for mercury vapor concentration: (a) adverse meteorological conditions (very unstable and 1 meter per second wind speed) and an 8-hour averaging time; (b) average meteorological conditions (neutral stability and 3 meters per second wind speed) and a 3-minute averaging time; (c) adverse meteorological conditions (very unstable and 1 meter per second wind speed) and 3-minute averaging time. The three cases were run to compare with the occupational eight-hour average, and to determine what short-term concentration might exist under average and adverse conditions. The highest concentration (~40 $\mu g/m^3$) occurs in Case 3, where the averaging time is shortened and the meteorological conditions are most conducive to producing high ambient levels.

Case 4 (Fig. E-4) pertains to a large coal-burning power plant (~12,000 tons of coal consumed per day). Stack gas concentrations of mercury were determined to be approximately 18 $\mu g/m^3$. (This compares to a concentration of approximately 167 $\mu g/m^3$ in the stack gases of the copper smelters.) The maximum concentration generated from two stacks (300 and 500 feet is 7 $\mu g/m^3$ -- well below any dangerous levels.



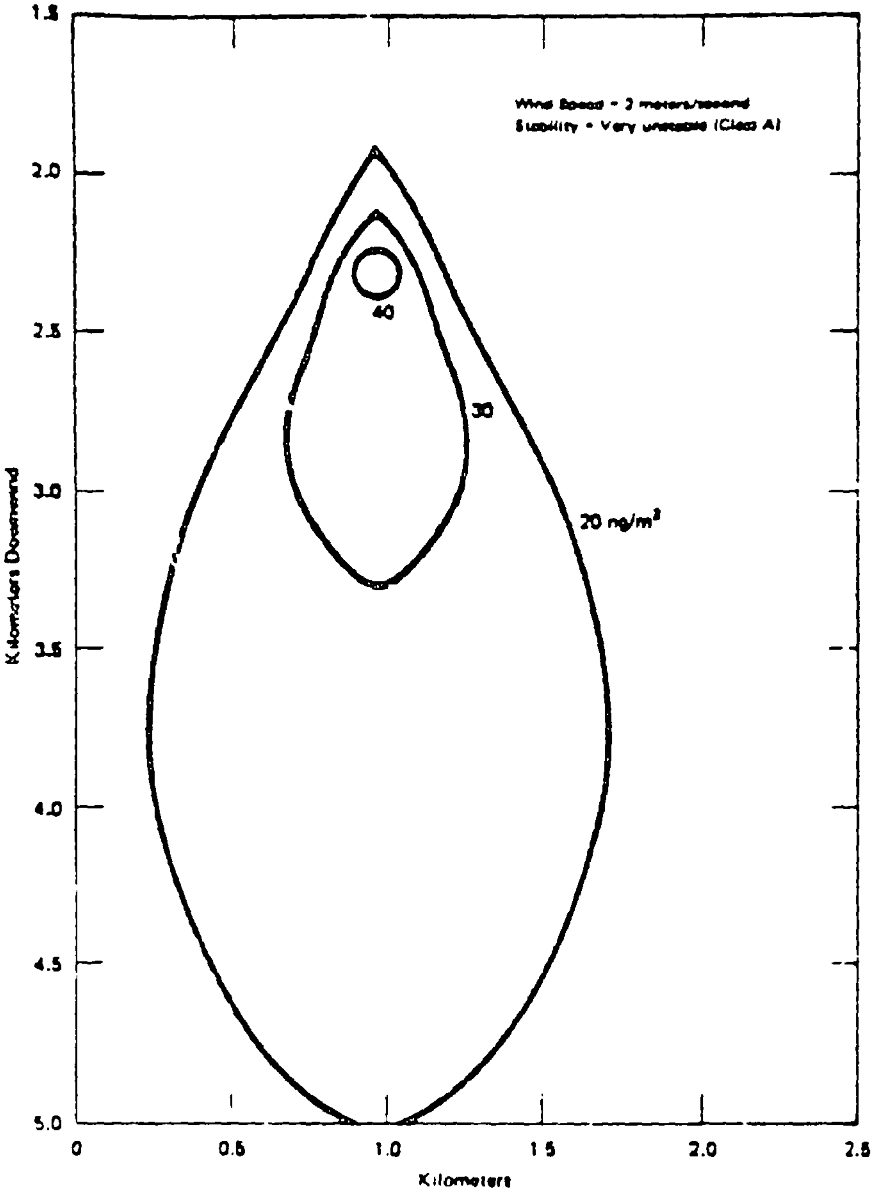
SOURCE URS Research Company

Figure E 1 CASE 1 COPPER SMELTER MERCURY VAPOR CONCENTRATION UNDER ADVERSE METEOROLOGICAL CONDITIONS (8 hour average)



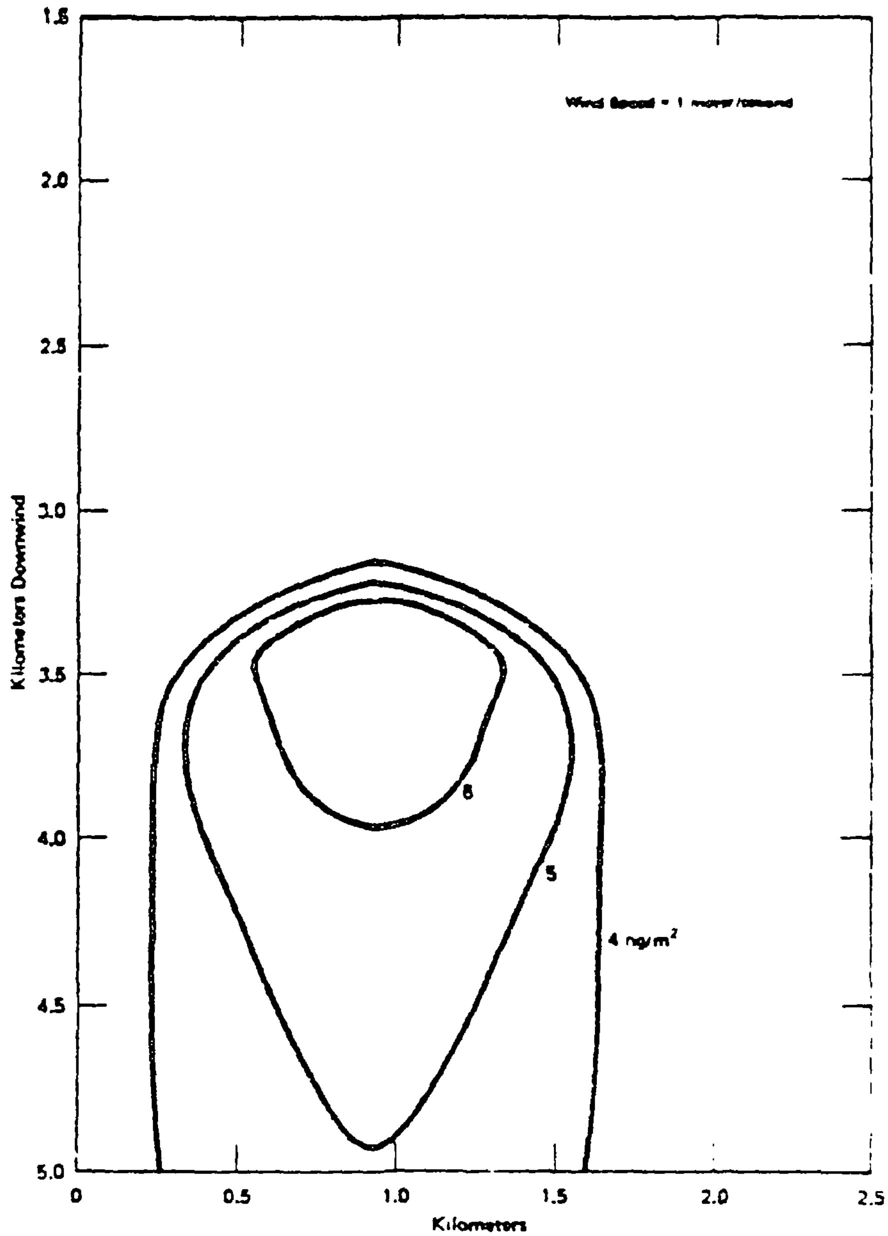
SOURCE URS Research Company

Figure E 2 CASE 2 COPPER SMELTER MERCURY VAPOR CONCENTRATION UNDER AVERAGE METEOROLOGICAL CONDITIONS (3-min avg)



SOURCE URS Research Company

Figure E 3 CASE 3 COPPER SMELTER MERCURY VAPOR CONCENTRATION UNDER ADVERSE METEOROLOGICAL CONDITIONS (3 minute average)



SOURCE URS Research Company.

Figure E-4 CASE 4: POWER PLANT MERCURY VAPOR CONCENTRATION UNDER ADVERSE METEOROLOGICAL CONDITIONS (3 minute average)

The mercury vapor concentrations generated from these two point sources are therefore going to be relatively small, even under the most adverse meteorological conditions. Although appreciable quantities of mercury are released from these two sources each year (1,372 kg from the smelter and 589 kg from the power plant in 1973), the emissions occur over a widespread area and are well dispersed before they could pose a hazard to the general population at ground level.

Another concern is the potential buildup of mercury in the soil adjacent to such sources as power plants and smelters. In order to arrive at an estimate of mercury in the soil, various assumptions had to b made:

- The mercury will be found to a soil depth of 10 cm.
- The average density of the soil is 2.5 gm/cm^3.
- Approximately 10 percent of the mercury emitted from an elevated point source is locally deposited within a radius of 10 km.
- Some 80 percent of the deposited mercury remains in the soil.
- The average background soil concentration of mercury is 71 ppb.
- The average life of mercury in soil is 20 years.

Using these relatively gross assumptions, a mercury concentration in soil adjacent to the copper smelter discussed previously was calculated. It was found that the smelter could contribute an additional 111 ppb to existing background. However, by changing the assumptions above to not unreasonable figures, the range of mercury concentrations in soil could be 70 to 890 ppb. Unfortunately, no specific data are available to correlate with these findings, although data points in the general area of the smelter do show elevated levels (>200 ppb).

Based on the information presented above, it appears that copper smelting operations do not pose a health hazard in terms of airborne emissions of mercury. It is very difficult to predict what happens to the mercury once it is released from the stack, as it may adhere to particles and settle out close to the plant, or it may be transported long distances, in which case it becomes part of a regional transport phenomenon. In any case, apparently no hazard to health will be produced as a consequence of air emissions from the smelter studied. Based on these findings and on mercury emissions data from other smelting operations, it seems that no further curtailment of operations, and no new controls, are necessary to reduce mercury emissions.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL. MOLYBDENUM

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
1. AMERICAN METAL CLIMAX INC. CLIMAX MOLYBDENUM MINE CLIMAX, CO. 80429	RURAL - FOREST SERVICE LAND	PASTURES CONTAINING 20 TO 100 PPM MOLYBDENUM MAY PRODUCE A DISEASE REFERRED TO AS "TEART" IN CATTLE AND SHEEP. IT IS CHARACTERIZED BY ANEMIA, POOR GROWTH RATE, AND DIARRHEA. THERE ARE NO DATA DOCUMENTING MOLYBDENUM TOXICITY IN MAN DUE TO INDUSTRIAL EXPOSURE.	WATER	NPDES CO0000248	EPA	
2 AMERICAN METAL CLIMAX INC. HENDERSON MINE, BOX 68 EMPIRE, CO. 80438 -30,000 TONS ONLY	RURAL - FOREST SERVICE LAND		WATER	NPDES CO0000230	EPA	
~~3. ARROWHEAD MINING CO. ([illegible])~~ ~~EUREKA MINE~~ ~~[illegible] 119~~ ~~([illegible] TUNGSTEN)~~			~~WATER~~	~~[illegible]~~	~~EPA~~	
4. CLIMAX MOLYBDENUM CO., DIV OF AMAX CLIMAX MINE, CLIMAX CO. MILLING	RURAL - FOREST SERVICE LAND		WATER	NPDES CO0034003	EPA	
5 CLIMAX MOLYBDENUM CO., DIV. OF AMAX MOUNT EMMONS PROJECT 4 MI WEST OF CRESTED BUTTE GUNNISON, CO. (POTENTIAL)	RURAL - FOREST SERVICE LAND		WATER	NPDES CO0035394	EPA	
6 ~~CONTRACT MINING CO.~~ ~~WOLF TONGUE MILL~~ ~~P.O. BOX 479~~ ~~NEDERLAND, CO. 80466~~ ~~(MAIN PRODUCT - TUNGSTEN)~~	~~RURAL~~		~~WATER~~	~~NPDES CO0033728~~	~~EPA~~	
7 ~~ROCHESTER ENTERPRISES~~ ~~(MONTANA)~~			~~WATER~~	~~[illegible]~~	TLV = 5 mg/m³ SOLUBLE MOLYBDENUM COMPOUNDS.	
8 URANIUM MINING - SECONDARY SOURCE 38 SOURCES	RURAL		WATER	ALL HAVE NPDES PERMITS	TLV = 10 mg/m³ INSOLUBLE MOLYBDENUM COMPOUNDS	
9 COPPER MINING + SMELTING 5 SOURCES	RURAL + URBAN		WATER, AIR	ALL HAVE NPDES PERMITS ION EXCHANGE ONLY DEMONSTRATED FULL-SCALE TECHNOLOGY	IRRIGATION WATER = 0.005 mg/l FOR CONTINUOUS USE. TOLERANCE FOR SHORT TERM USE IN FINE TEXTURED SOIL IS 0.05 mg/l.	

REGION VIII TOXICS INTEGRATED STRATEGY

Candidate Chemical: Molybdenum

Major Sources:

Molybdenite is the greatest source of molybdenum, the largest known deposit being the one in Climax, Colorado. Seventy five percent of the world's known reserves of molybdenum are in the western parts of North and South America. Large deposits are known to exist in the U.S.S.R., Canada, and Chile. In the U.S. most molybdenum comes as the primary product from the processing of molybdenite, but a substantial fraction is obtained in connection with processing of copper, tungsten, or uranium ores. Moleybdenum can also be obtained by recycling of scrap materials.

In Region VIII there are two major molybdenum mines presently in operation. These are the AMAX Mine in Climax, Colorado and the AMAX Henderson Mine in Empire, Colorado. AMAX is also proposing to mine molybdenum 4 miles west of Crested Butte, Colorado (Mount Emmons Project). A draft environmental impact statement on the Mount Emmons Project should be available sometime during 1980.

Secondary sources in Region VIII include two tungsten mines, five copper mining and smelting sites and thirty eight uranium mining sites.

Population-at-Risk (Environmental Exposure)

The majority of the molybdenum sources are in a rural setting. Many are sited on U.S. Forest Service land.

Health and Environmental Effects

A limited amount of data suggests that molybdenum has a relatively low order of toxicity. Despite the fact that human beings are exposed to relatively high amounts of molybdenum (100-500 mg/day), primarily via food, there is no substantial age-related accumulation of molybdenum in the body.

Pastures containing 20-100 ppm molybdenum may produce a disease referred to as "teart" in cattle and sheep. It is characterized by anemia, poor growth rate, and diarrhea. The disease may be prevented or cured by the administration of copper compounds or removal of animals from the areas high in molybdenum. The disease may be reproduced experimentally.

Information into possible toxic effects in human beings is scarce. There are data from the U.S.S.R. literature pointing towards the possibility that exposure to some molybdenum dusts may give rise to pulmonary disorders in the form of pneumsconiosis.

Entry into Environment

The primary route for entry into the environment is in water. All the sources in Region VIII have NPDES permits.

Contral Mechanism Available

Information on molybdenum removal from wastewaters is not available in the literature.

Current Agency and Other Efforts

There exists a TLV of 5 mg/m^3 for soluble molybdenum compounds and a TLV of 10 mg/m^3 for insoluble molybdenum compounds.

In irrigation water a maximum of 0.005 mg/l is suggested when used continuously.

Tolerance for short term use in fine textured soil is 0.05 mg/l

Cost/Benefit

Unknown.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: Nitrates/Nitrites

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	COST/BENEFIT
Fertilizers containing nitrogen Municipal and industrial wastewaters Meat preservatives Feed lots, sludges, Solid wastes	It is estimated that public community water systems serving approximately 25,000 people in Region VIII contain nitrates in excess of the maximum allowable level of 10 mg/l NO_3-N in the primary drinking water regulations. If it is assumed that infants under 6 months of age constitute 1% of the population at any one time in these communities then approximately 250 infants are under direct exposure at any given time. This exposure presents a serious risk. Further, over a period of time the number of infants potentially affected rises considerably. In addition, the community water systems with high nitrate concentrations do not include the many small public water systems that are classified as non-community systems and the individual systems or other small non-public systems serving less than 25 people or which have fewer than 25 connections	Nitrates and nitrites exert a toxic effect primarily by ingestion of drinking water by infants under 6 months of age. Ingestion of water containing approximately 10 mg/l NO_3-N can result in a blood disorder known as methemoglobinemia. Within the body there is bacterial conversion of nitrate to nitrite. Nitrite converts hemoglobin to methemoglobin which can no longer act as an oxygen transport mechanism in the blood and the infant suffers from oxygen deprivation or suffocation. Ingestion of nitrite directly is obviously even more dangerous; however, fortunately, nitrites seldom exist in water in significant amounts. Waters with nitrite nitrogen concentrations of 1 mg/l or greater should be avoided for infant feeding as should waters with nitrates in excess of 10 mg/l NO_3-N.	As indicated elsewhere, the principal mechanism for entry into the environment is through public and private drinking water systems. Nitrates also are introduced into the environment as preservatives in meat products; however, this is not believed to be an important source of nitrates for infants under 6 months of age.	The principal control mechanism is through public drinking water programs (state and federal) and public health programs. Since it is not practical to remove nitrates in drinking waters, most programs are aimed at problem identification, public notification, and making provisions to supply infants with alternate sources of waters with safe nitrate levels which are otherwise safe for drinking. Long range control utilizes the development of alternate sources of water low in nitrates, regionalization of small systems into larger systems and connection of individual residences to public water systems which deliver water of satisfactory quality.	EPA Region VIII currently is involved in the administration of the federal safe drinking water programs in Region VIII states. Three states - Colorado, North Dakota and Montana, implement the federal program within their boundaries. In the other three states of Utah, Wyoming and South Dakota, the Regional Office implements the federal program.	In almost all states the benefits of control programs are considered to far exceed the costs. This even includes programs aimed at individual water system users in most states. However, small non-community public water systems have sometimes escaped control. These are now coming under the provisions of the federal safe drinking water program.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: PCB's

PREPARED BY: RALPH H LARSEN

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION ASSUME 1 INSPECTION = $130.00
1. TRANSFORMER REPAIR INDUSTRY APPROX. 34 SHOPS CO - 16 S.D. - 8 UTAH - 7 MONT. - WYO. - 3 N.D. - 0	URBAN AND RURAL ≃ 1 MI. RADIUS	LOW ACUTE TOXICITY, BIOACCUMULATE IN TISSUES OF MANY SPECIES. EXHIBITS CHRONIC (LONG-TERM) TOXICITY TO MANY SPECIES EVEN WHEN THE EXPOSURE IS TO VERY LOW CONCENTRATIONS. EFFECTS ROUGHLY COMPARABLE TO THOSE OF DDT. LITTLE IS KNOWN ABOUT THE TOXIC EFFECTS OF PCB's IN HUMANS. PCB CONTAMINATION IS FOUND TO BE ALMOST UNIVERSAL, INCLUDING HUMAN MILK, HUMAN ADIPOSE TISSUE, AND BRAIN AND LIVER OF SMALL CHILDREN.	AIR, WATER, SOLID WASTE	TSCA PCB REGS. LABELING, HANDLING, STORAGE, DISPOSAL REG. NPDES PERMITS.	EPA, NIOSH - CRITERIA DOCUMENT ON PCB's - 1977	$4,420
2. ELECTRIC UTILITIES APPROX. 283 S.D. - 67 CO. - 60 N.D. 46 UT. - 43 WY. - 35 MT. - 32	URBAN AND RURAL ≃ 1 MI. RADIUS		AIR, WATER, SOLID WASTE	TSCA PCB REGS.	EPA	$30,940
3. SCRAP YARDS	URBAN AND RURAL ≃ 1/2 MI RADIUS		WATER, SOLID WASTE	TSCA PCB REGS.	EPA	
4. INVESTMENT CASTING INDUSTRY 1 SOURCE IN DENVER, CO.	10 URBAN		AIR, SOLID WASTE	TSCA PCB REGS.	EPA	$130
5 MINES UNDERGROUND - 244 SURFACE - 910	RURAL		WATER, SOLID WASTE	TSCA PCB REG. NPDES PERMIT	EPA	$150,020
6 MINING EQUIPMENT DEALERS 10 SOURCES	URBAN AND RURAL APPROX ½ MI RADIUS		SOLID WASTE	TSCA PCB REG.	EPA	
7. FEDERAL FACILITIES 25 SOURCES	URBAN AND RURAL ≃ 1/2 MI. RADIUS		WATER, SOLID WASTE	TSCA PCB REG.	EPA	
8. WASTE OIL DEALERS 6 SOURCES	URBAN AND RURAL ≃ 1/2 MI. RADIUS		AIR, WATER, SOLID WASTE	TSCA PCB REG., CWA SEC. 311	EPA	
9. APPROVED INCINERATORS NONE	0		AIR	TSCA PCB REG	EPA	0
10. APPROVED CHEMICAL LANDFILLS NONE	0		WATER, AIR	TSCA PCB REG.	EPA	0
11. USE IN HYDRAULIC AND HEAT TRANSFER FLUIDS	UNKNOWN		WATER, SOLID WASTE	TSCA PCB REG.	EPA	UNKNOWN
12 SEWAGE TREATMENT PLANTS SOURCES - 1,153	URBAN AND RURAL		WATER, SLUDGE	NPDES PERMIT.	EPA	
13. MAJOR PUBLIC BUILDINGS - HOSPITALS, OFFICE BLDGS, ETC. 100 SOURCES - APPROX	URBAN AND RURAL ≃ 1/2 MI RADIUS		SOLID WASTE	TSCA PCB REG	EPA	
14. RAILROADS	URBAN AND RURAL		WATER, SOLID WASTE	TSCA PCB REG.	EPA	

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL: POLYCHLORINATED BIPHENYLS (PCB's)

Major Sources

The major potential sources of PCB's in Region VIII are as follows:

- Transformer Repair Industry

There are approximately 34 repair shops in the Region. The majority of shops do not now repair PCB transformers although most did in previous years. The potential for pollution from past work practices is great along with the fact that many non-PCB transformers are contaminated with PCB's. Several shops are still repairing PCB transformers.

- Electric Utilities

There are approximately 283 sites operated by electric utilities that are potential sources of PCB's. These sites often store large numbers of transformers and capacitors.

- Scrap Yards

All transformers that cannot be repaired are scrapped in the local junk yards. Even if transformers are drained, some oil finds its way to the junk yard. There are approximately 135 scrap dealers in our Region.

- Investment Casting Industry

Only one investment casting shop was located in the Region. Any PCB's present would probably be from past work practices.

- Mines

There are approximately 1154 mining sources in Region VIII where one might find PCB transformers, capacitors, or PCB-containing mining equipment.

- Mining Equipment Dealers

There are approximately 10 dealers where one might find PCB-containing mining equipment.

- Federal Facilities

There are at least 25 sources that have PCB transformers or capacitors. This would include Bureau of Reclamation sites, GSA, and Department of Defense facilities.

- <u>Waste Oil Dealers</u>

There are approximately 6 waste oil dealers in the Region. Many electric utilities and rebuilding shops dispose of waste transformer oil through these dealers.

- <u>Major Public Buildings</u>

Many large buildings contain PCB transformers. It is estimated that approximately 100 exist in the Region.

- <u>Sewage Treatment Plants</u>

Much of the PCB's in industry finds its way into the sewage treatment plants and comes out in the sludge. There are approximately 1153 sources, many of which have never been checked for PCB's.

- <u>Railroads</u>

Many of the railroad facilities may contain PCB transformers or capacitors.

<u>Population At Risk/Environmental Exposure</u>

The sources in our Region are located in both rural and urban environments.

<u>Health and Environmental Effects</u>

PCB's, as a class of compounds, are extremely persistent and non-biodegradable substances, and tend to bioaccumulate in the aquatic environment by factors of a few thousand to several hundred-thousand-fold. The most serious effect of PCB's on aquatic species is their ability to interfere in the reproductive process and hatchability of fish eggs.

The toxicity of PCB's to humans was demonstrated in 1968 when a mass poisoning occurred in Japan. Symptoms included swelling of the upper eyelids, urinal impairment, acne-like formations, and heightened pigmentation of the skin. Patients with this disease also exhibited neurological disorders and showed signs of hearing loss. Babies born to women patients were born smaller than the national average.

PCB contamination is almost universal and has been found in human milk, human adipose tissue and in brain and liver of small children.

<u>Entry Into The Environment</u>

PCB's from the various sources find their way into the environment in all media. When incomplete combustion of waste oil occurs, air pollution occurs, eventually causing water pollution. Improper disposal practices of PCB equipment can cause pollution in all media.

Control Mechansims Available

Air - Air pollution from incineration of waste transformer oil can be prevented only if an adequate temperature and dwell time is obtained to ensure decomposition of PCB's.

Water - Holding ponds with oil skimmers can be used to remove PCB's from water. Also carbon adsorption systems are effective, although expensive in removing PCB's.

Solid Waste - According to the TSCA PCB Disposal and Marking Regulations, certain PCB wastes must go to EPA-approved landfills.

Strong enforcement of the Marking and Disposal Regulation will control PCB's at the source before pollution occurs. NPDES permits can also be used.

Current Agency and Other Efforts

EPA under TSCA has a Marking and Disposal Regulation for PCB's. A manufacturing, processing , and distribution in commerce regulation is about to become final.

FDA proposed lowering the existing guidelines for PCB's in certain foods in April, 1977. NIOSH published a criteria document in September of 1977.

Cost/Benefit

Since the benefits are health-related, they are difficult to quanitfy. The costs involved in controlling PCB's would be the cost of performing inspections at each facility. These are summarized on the attached sheet.

REGION VIII TOXICS INTEGRATED STRATEGY

CANDIDATE CHEMICAL. Vanadium

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
Vanadium Mines Colorado - 118 Utah - 46	Rural	Acutely toxic to humans and animals Toxic effects to aquatic life unknown; under study	Water	Unknown	Unknown	Resource Allocation: Multimedia sampling of major sources and surrounding areas
Vanadium Mills Union Carbide's Rifle Mill, Rigle, CO Union Carbide's Uravan Mill Uravan, CO Mines Development, Inc. Edgemont, S.D. (Inactive) Atlas Minerals - Moab, Utah	Rural	Acutely toxic to humans and animals	Air/Water	Unknown	Uranium Mill Tailings Radiation Control Act of 1978 - regulated by NRC & EPA	Benefit: Develop basline data of vanadium levels in suspect area
Coal and Oil Combustion	Urban/Rural	Acutely toxic to humans and animals	Air	Cyclones Electrostatic precipitators	EPA-sponsored "Coal Fired Power Plant Trace Element Study"	

VANADIUM

Major Sources

Vanadium Mines and Mills: Vanadium is almost always found in conjunction with uranium. Union Carbide's Rifle Mine is the only mine currently producing vanadium as its principal product. Colorado is the second highest producer of vanadium among the states. San Miguel, Montrose, Garfield and Mesa were the leading counties of vanadium-bearing ore and vanadium production. Exact figures pertaining to vanadium production are confidential.

Coal and Oil Combustion: Atmospheric emissions during the year 1968 in the U.S. due to the combustion of fuel oil and coal were 17,000 tons and 1,750 tons respectively. Current studies of vanadium emissions from coal and oil-fired power plants in Region VIII could not be found. Emissions from each plant would vary with the amount of vanadium residue present in the coal and oil burned and with the control mechanism used.

Population at Risk

In addition to the segment of population living in the vicinity of vanadium mines and mills and power plants burning vanadium-rich coal and oil, workers in the following occupations also have potential exposure to vanadium:

- alloy makers
- boiler cleaners
- ceramic makers
- dyemakers
- ferrovanadium workers
- glassmakers
- inkmakers
- organic chemical synthesizers
- petroleum refinery workers
- photographic chemical workers
- textile dye workers
- uranium millers
- vanadium alloy makers
- vanadium miners
- vanadium millers
- vanadium workers

According to 1977 NIOSH estimates, approximately 174,000 employees in the U.S. have potential exposure to vanadium.

Toxicity

Vanadium is nontoxic as a metal, but is acutely toxic to humans and animals in its pentavalent form. (Vanadium in the atmosphere is usually found as vanadium pentoxide.) Workers exposed to high concentrations of vanadium dust have suffered symptoms ranging from eye and skin irritations to coughing, difficulty in breathing, bronchitis and chest pains. Chronic effects from vanadium exposure have not been adequately studied, although chronic exposure to environmental air containing vanadium has been statistically linked to mortality rates from heart diseases and certain cancers. No studies were found on adverse effects of vanadium on plants.

Agency Efforts

In 1977, NIOSH published a criteria document for a recommended standard for occupational exposure to vanadium. OSHA has not yet published a standard for same. EPA has no drinking water standard established for vanadium. EPA has also not established vanadium effluent and emission guidelines in connection with the issuance of NPDES permits. The American Conference of Governmental Industrial Hygienists recommended the following threshold limit values for vanadium:

Vanadium pentoxide dust: 0.5 mg/m^3 as V_2O_5

Vanadium pentoxide fume: 0.1 mg/m^3 as V_2O_5

<u>REGION VIII TOXICS INTEGRATED STRATEGY</u>

CANDIDATE CHEMICAL. Zinc

MAJOR SOURCES (REGION VIII) - AVERAGE ANNUAL PRODUCTION (REGION VIII)	POPULATION-AT-RISK/ ENVIRONMENTAL EXPOSURE	HEALTH & ENVIRONMENTAL EFFECTS	ENTRY INTO ENVIRONMENT	CONTROL MECHANISM AVAILABLE	CURRENT AGENCY & OTHER EFFORTS	RESOURCE ALLOCATION
<u>Mines and Mills</u> New Jersey Zinc Company, Eagle, Co. (mine/mill) ASARCO, Inc. & Resurrection Mine, Leadville, Co. (mine/mill) Newmont Idarado Mine, Ouray County Standards Metal Corp., Sunnyside Mine, Silverton, Co. Park City Ventures, Ontario Mine, Juab County Tintic Division of Kennecott Corp., Burgen Mine, Utah County Anaconda Co., Butte, Mt Homestake Bulldog, Creede, Co. (mine/mill) Homestake, Lead, S.D. (mine/mill) Amax, Inc., Mt. Emmons, Crested Butte, Co., (mine) Emission Factor: 0.2 lb/ton zinc mined	7,490 pop - rural 4,314 pop - rural 741 pop - rural 797 pop. - rural pop. unknown - rural pop. unknown - ryral 23,358 pop - urban	Acute: Metal fume fever usually occurs after respiratory exposure to freshly generated zinc fumes. Symptoms are headache, fever, chills, aching, nausea, (malaria-like symptoms). Non-fatal. Recovery is usually in 2 days. It is estimated that metal fume fever does not occur below 15 mg/m^3. Air concentration of zinc oxides and exposure time causing metal fume fever is unknown. Chronic: Unknown Zinc is also toxic to aquatic life.	Air - moderate loses of zinc into the atmosphere during mining Water - treatment by wet flotation in milling result in emissions into water Solid Waste - 2 sources - one saying there is significant contamination and the other saying no potential hazardous wastes from treatment & disposal of wastes generated in mining of zinc ores	filtration, lime precipitation settling	NIOSH - criteria document on zinc oxide Safe Water Drinking Act is 5 mg/L No ambient air standards Water standard is .05 mg/L	1) Multi-media sampling of the major sources Benefit - none. All the data available reports that zinc is non-toxic
Precisions Foundries (ASARCO, Inc.) Denver, Co	Urban		Air - large emissions which often results in cadmium emissions Solid Waste - high zinc wastes around smelters then compared to controlled areas	hoods, baghouses precipitators		
Brass Foundries - Utah - 2, Montana - 2 Colorado - 7 0.18 lb/ton of process weight.	Urban		Water Water, Air and Solid Waste	Baghouses & filtration		

ZINC

Zinc is essential to all living organisms. It is a normal constituent of the human body. The daily requirement for human beings has been recommended as 15 mg/daily for adults.

ZINC PRODUCTION

In 1976, Colorado produced 10% of the zinc in the United States. The following is a table for the zinc produced in our Region for 1974, 1975, 1976, and 1977.

State				
Colorado	49,489 tons	48,460 tons	50,621 tons	Unknown*
Montana	136 tons	110 tons	64 tons	Unknown
Utah	12,619 tons	19,640 tons	22,481 tons	18,300 tons

*Unknown - due to confidentiality

The major mines that produce zine for Colorado are:

Idarado Mine - in 1976, ranked 19th in the nation for the production of zinc. It treated 361,000 tons of ore making 3.83% zinc. Ore reserves were 3.5 million tons grading approximately 4.4% zinc.

Resurrection Mine - in 1976, ranked 9th in the nation for the production of zinc. It milled 200,000 tons of ore grading 9.26% zinc. Ore reserves were 2 million tons grading approximately 9.94% zinc.

Sunnyside Mine (Standards Metal) - in 1976, ranked 25th in the nation for the production of zinc. There are no figures available for the amount of zinc this mine produced.

New Jersey Zinc Mine - There are no figures available for the amount of zinc this mine produced.

Other zinc mines in Colorado are Big Ten Construction, Littleton, Co., Falcon Mines, Inc., Montrose, Co., U.S. Mine and Mineral, Denver, Co., Homestake Mining Co., Bulldog Mine and Mill, Creede, Co., Houston Oil and Minerals Corp., Emperius Mine, Creede, Co., and Climax Molybdeum, Climax, Co.

The major mines that produce zinc for Utah are:

Kennecott - in 1976, ranked 18th in the nation for the production of zinc. No figures are available for the amount of zinc this mine produced.

Park City Ventures - mined 174,888 tons of ore and purchased 12,437 tons. The mill ore graded approximately 7.4% zinc.

Smelters

Primary Smelter

Precisions Foundries (ASARCO, Inc.) - 3055 E. 52nd Ave., Denver, Co.

Primary and Secondary Smelters of Non-Ferrous Metals

U.S. National Metals, Salt Lake City, Ut.
ASARCO, Inc., 495 E. 51st Ave., Denver, Co.
Beryl Ores Co., 100 Ave. and Alkire St., Broomfield, Co.

Primary

Great Falls Refinery, Great Falls, MT.
Canyonlands 21st Century Corp., Blanding, Ut.
Mackay, B.R. & Sons, Salt Lake City, Ut.
United Refinery, Salt Lake City, UT.
Cozinco, Inc., Salida, Co. (zinc sulfate)
Wensley Metal Products Co., 1445 Osage, Denver, Co.
(lead, zinc, tin, bablitt, solder)

Secondary

Brass Foundries

Star Brass Foundry & Ref. Co., Salt Lake CIty, Ut.
State Brsss Foundry, Salt Lake City, Ut.
Act Powell Bronze Foundry, Kalispell, Mt.
Brubaker and Associates, Inc., Kalispell, Mt.
Advance Foundry Inc., Lafayette, Co.
American True Foundry Co. Inc., Broomfield, Co.
Fountain Foundry, Inc., Pueblo, Co.
Mile -Hi Metal Foundry, Inc., Denver, Co.
Quest Corp., Boulder, Co.
Reffel, J.W., Metal Foundry, Englewood, Co.
Slack Horner Foundries, Longmont, Co.

Other misc. uses of zinc include diecasting, dry cell batteries, houschold utensils, castings, printing plates, building materials, fiber production, railroad car linings, automotive equipment, as a reducing agent in organic chemistry, deoxidizing bronze.

Environmental Exposures

Plants - 10-100 mg/kg of zinc are found in most crops and pasture land. Insufficient concentrations of zinc is a common micro-nutrition deficiency in crops. Toxicity of zinc amoung plants is rarely seen in areas other than those close to emission sources.

Animals - various epidemiological studies have been done on experimental animals. See Attachment 2.

Human - food poisoning from acidic food prepared in zinc galvanizing containers.

Water. - zinc content in water may be increased if water flows through galvanized copper or plastic pipes.

Effluent Limitations (NPDES)- Daily and 30 day Average

Ore Mining: Mine draining from underground or open pit

Daily: 1.0 mg/L
Average: 0.5 mg/L

Milling:

Daily: 0.4 mg/L
Average: 0.2 mg/L

Zinc: Best practical control technology available

Daily: 0.08 lb/1000 lb. product
Average: 0.04 lb/1000 lb. product

Zinc: Best available technology economically available

Daily: 0.054 lb/1000 lb. product
Average: 0.027 lb/1000 lb. product

Wastewater

Industries discharging significant quantities of zinc into wastewater streams include zinc and brass metal works, zinc and brass plating, silver and stainless steel tableware manufacturing, viscose rayon yarn and fiber production, groundwood pulp production and newsprint paper production.

Toxicity

Chronic toxicity in humans is unknown but cadmium (highly toxic) is closely related to zinc and is obtained as a by-product wherever zinc is refined. Therefore, cadmium exposure should be taken into account when zinc and zinc compounds are handled.

Emission Factors

The following is a list of zinc emission factors for various processes:

Metallurgical Processing:

Electrolytic Plants	60.0 lb/ton of product
Vertical-Retort Plants	80.0 lb/ton of product
Horizontal-Retort Plants	170.0 lb/ton of product
Secondary Production	20.0 lb/ton of zinc produced

End Product Uses of Zinc

Zinc-Base Alloys	10.0 lb/ton of zinc processed
Zinc Coatings	4.0 lb/ton of zinc processed
Brass and Bronze	2.0 lb/ton of zinc content
Zinc Oxide Production	60.0 lb/ton of zinc oxide
Rubber Tire Wear	4.2 lb/million miles

Other Emission Sources

Coal	17.0 lb/1000 tons of coal burned
Oil	1.4 lb/1000 bbls of oil burned
Blast Furnaces	0.02 lb/ton of pig iron produced
Open-Hearth Furnaces	1.3 lb/ton of steel produced
Basic Oxygen Furnaces	0.03 lb/ton of steel produced
Electric Furnaces	0.74 lb/ton of steel produced

Other Environmental Levels & Exposures

Solid Waste - concentration varies between 10 and 300 mg/kg dry weight.
Air - urban areas less than 0.01 to 0.84 micrograms/m^3,
rural areas 0.01 to 0.2 micrograms/m^3.

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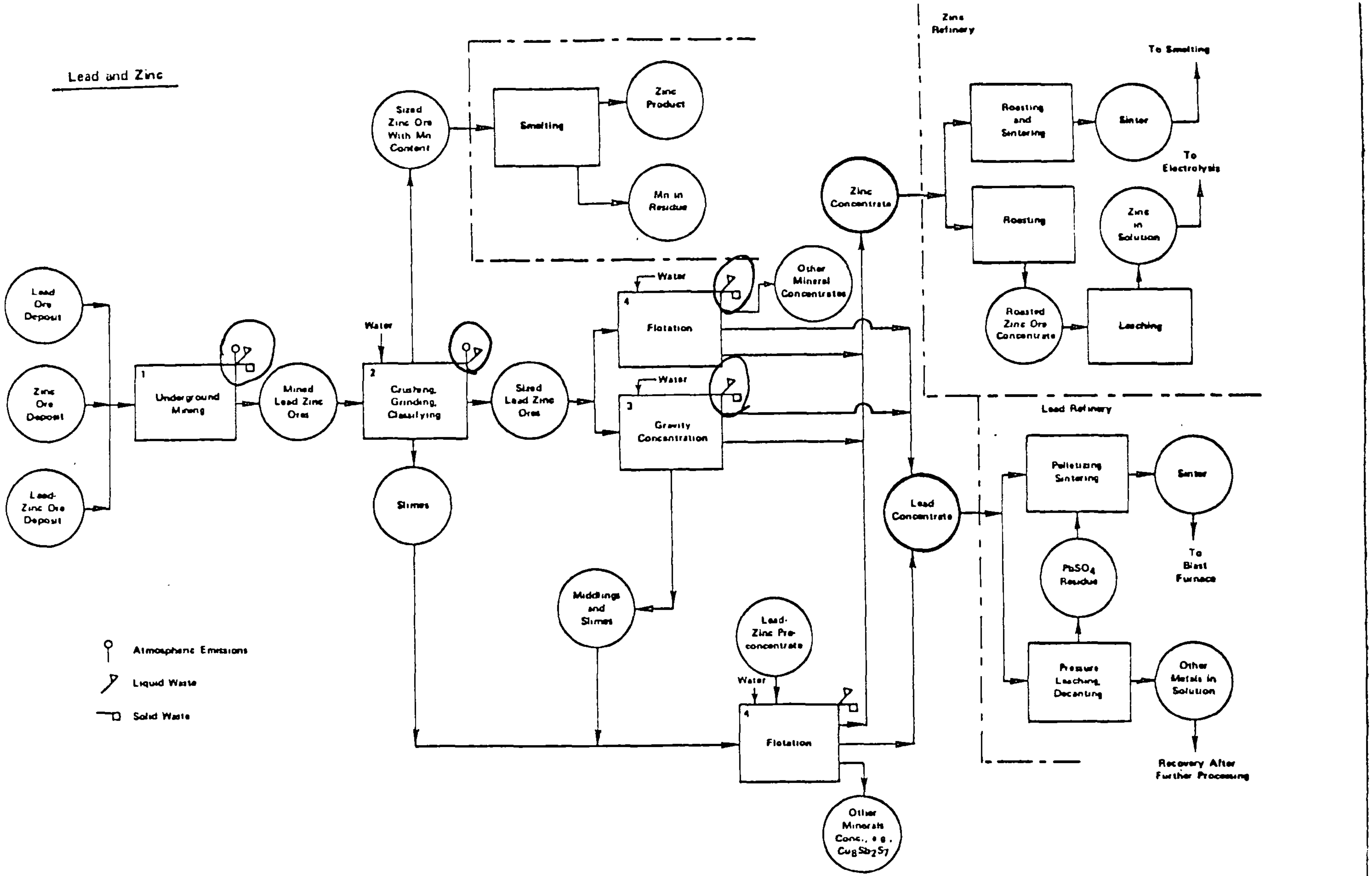
Lead and Zinc



ATTACHMENT 1

U.S. DEPT OF HEW - PRELIMINARY AIR POLLUTION SURVEY OF ZINC & ITS COMPOUNDS

TABLE 1

SELECTED DATA ON ACUTE ZINC TOXICITY IN EXPERIMENTAL ANIMALS[59]

Zinc Compound	Animal[a]	Route of Admin.[b]		Dosage µg/kg
Zinc acetate	Rabbit	or	MLD	976,000-1,966,000
Zinc chloride	Rat	iv	LD	60,000-90,000[c]
Zinc diethyldithio-carbamate	Rabbit	or	LD_{50}	600,000
Zinc ethylene-bis-dithiocarbamate	Rat	or	LD_{50}	>5,200,000
Zinc phosphide	Rat[d]	or	LD_{50}	40,500±2,900
	Rat	or	LD_{50}	46,700
Zinc sulfate,[e] $ZnSO_4 \cdot 7H_2O$	Frog	sc	LD	149,000
	Rat	or	LD	2,200,000
	Rat	sc	LD	330,000-440,000
	Rat	iv	LD	49,300-61,000
	Rabbit	or	LD	1,914,000-2,200,000
	Rabbit	sc	LD	>220,000-440,000
	Rabbit	iv	LD	44,000
	Dog	sc	LD	78,000
	Dog	iv	LD	66,000-110,000
Ziram	Mouse♀	ip	LD_{50}	73,000±1,000
	Rat	or	LD_{50}	1,400,000±99,000
	Rat♂	ip	LD_{50}	23,000±2,000
	Rat♀	ip	LD_{50}	33,000±5,000
	Guinea pig	or	LD_{50}	100,000-150,000
	Guinea pig	ip	LD_{50}	20,000-30,000
	Rabbit	or	LD_{50}	100,000-1,020,000
	Rabbit	or	LD_{50}	400,000
	Rabbit	ip	LD_{50}	5,000-50,000

[a] ♀: female; ♂: male.

[b] ip: intraperitoneal; iv: intravenous; or: oral; sc: subcutaneous.

[c] 1% solution in H_2O.

[d] Norway.

[e] The most common form of zinc sulfate.

ATTACHMENT 2

APPENDIX D

CANCER MAPS FOR REGION VIII

Attached are maps for each state within the Region. One set of maps show which counties have excess cancer mortality along with the body site where the cancer occurs. The other set of maps show geographic locations of various industry groups.

"Excess cancer mortality" means that the county exhibited an age-adjusted mortality rate from 1950 to 1969 for a specific body site which was significantly higher than the national average. Notice that cancer of a particular body site often clusters in certain areas of a given state and patterns begin to appear. The obvious question is, "What is the cause of these definite patterns?" Certainly ethnic background is an important factor along with diet and habits of a particular region. It has been stated that a high percentage of cancers are environmentally caused. Statistically speaking, about 5% of the significant excesses shown are artifacts in the data and are false positives meaning they are not, in fact, significant excesses at all. Given these caveats it is still a worthwhile exercise to examine the cancer patterns to see if they might be remotely associated with environmental pollution factors (e.g., cancers follow a river basin, occur near certain major industires or agricultural operations, surround a water supply characteristic, etc.).

KEY

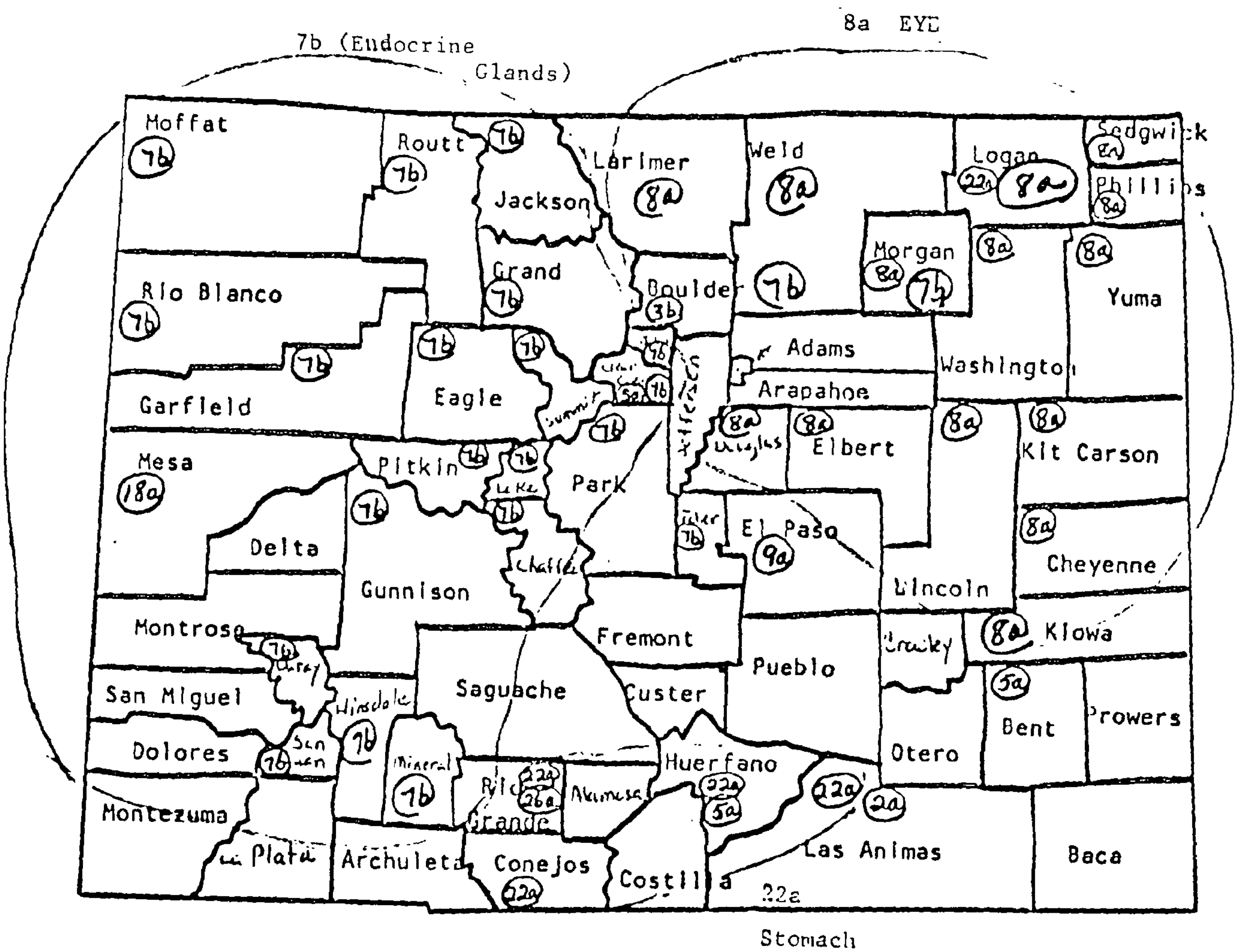
Cancer Sites

1	All Sites Combined
2	Biliary Passages and Liver
3	Brain and Other Parts of Nervous System
4	Breast
5	Cervix Uteri
6	Connective Tissue
7	Other Endocrine Glands
8	Eye
9	Hodgkin's Disease
10	Kidney
11	Leukemia
12	Lip
13	Lymphosarcoma and Reticulosarcoma
14	Multiple Myeloma
15	Nasopharynx
16	Nose, Nasal Cavities and Sinuses
17	Ovary
18	Pancreas
19	Prostrate
20	Rectum
21	Salivary Glands
22	Stomach
23	Testis
24	Trachea, Bronchus and Lung
25	Thyroid Gland
26	Other and Unspecified Sites

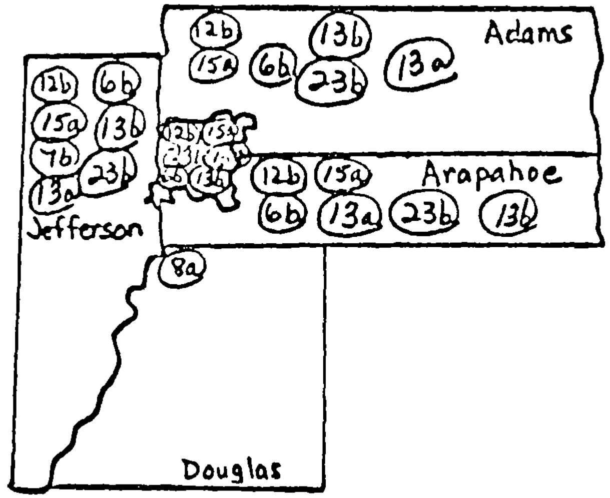
a	Highly Significant
b	Significant

<u>LEGEND</u>

- Chemicals and Allied Products (including Pesticide Producing Establishments)
- Federal Installations
- Minerals Mining
- Petroleum Refineries
- Power Plants
- (Major) Publicly Owned Treatment Works (POTW's)
- Smelters
- Steel Mills
- Uranium Production Areas


7b (Endocrine Glands)
8a EYE
Moffat
Routt
Jackson
Larimer
Weld
Logan
Sedgwick
Phillips
Morgan
Yuma
Grand
Boulder
Rio Blanco
Adams
Washington
Arapahoe
Eagle
Garfield
Summit
Jefferson
Douglas
Elbert
Kit Carson
Mesa
Pitkin
Lake
Park
Delta
Teller
El Paso
Cheyenne
Chaffee
Gunnison
Lincoln
Montrose
Fremont
Kiowa
Crowley
Ouray
Pueblo
San Miguel
Saguache
Custer
Hinsdale
Bent
Prowers
Dolores
San Juan
Otero
Mineral
Huerfano
Rio Grande
Alamosa
Montezuma
Las Animas
Baca
La Plata
Archuleta
Conejos
Costilla
22a
Stomach

COLORADO



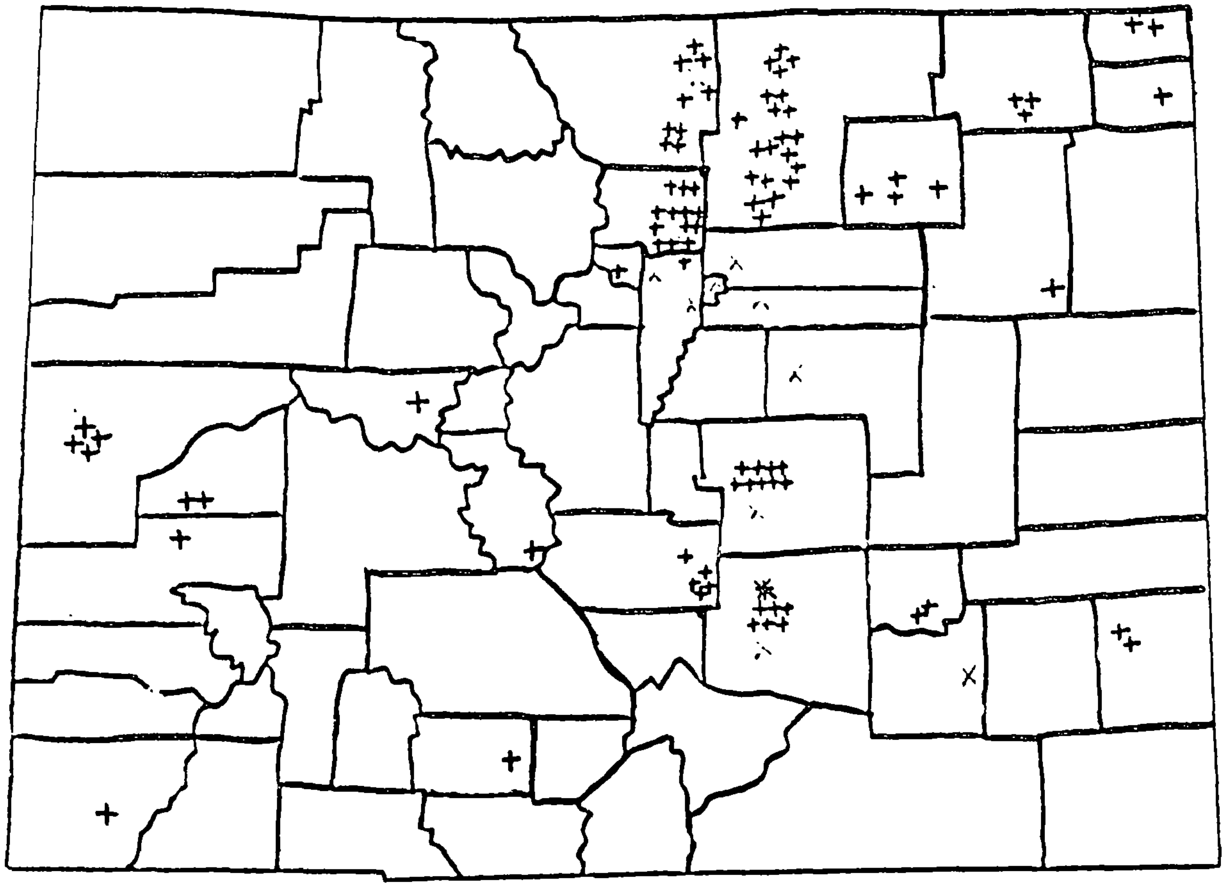
METROPOLITAN DENVER

COLORADO

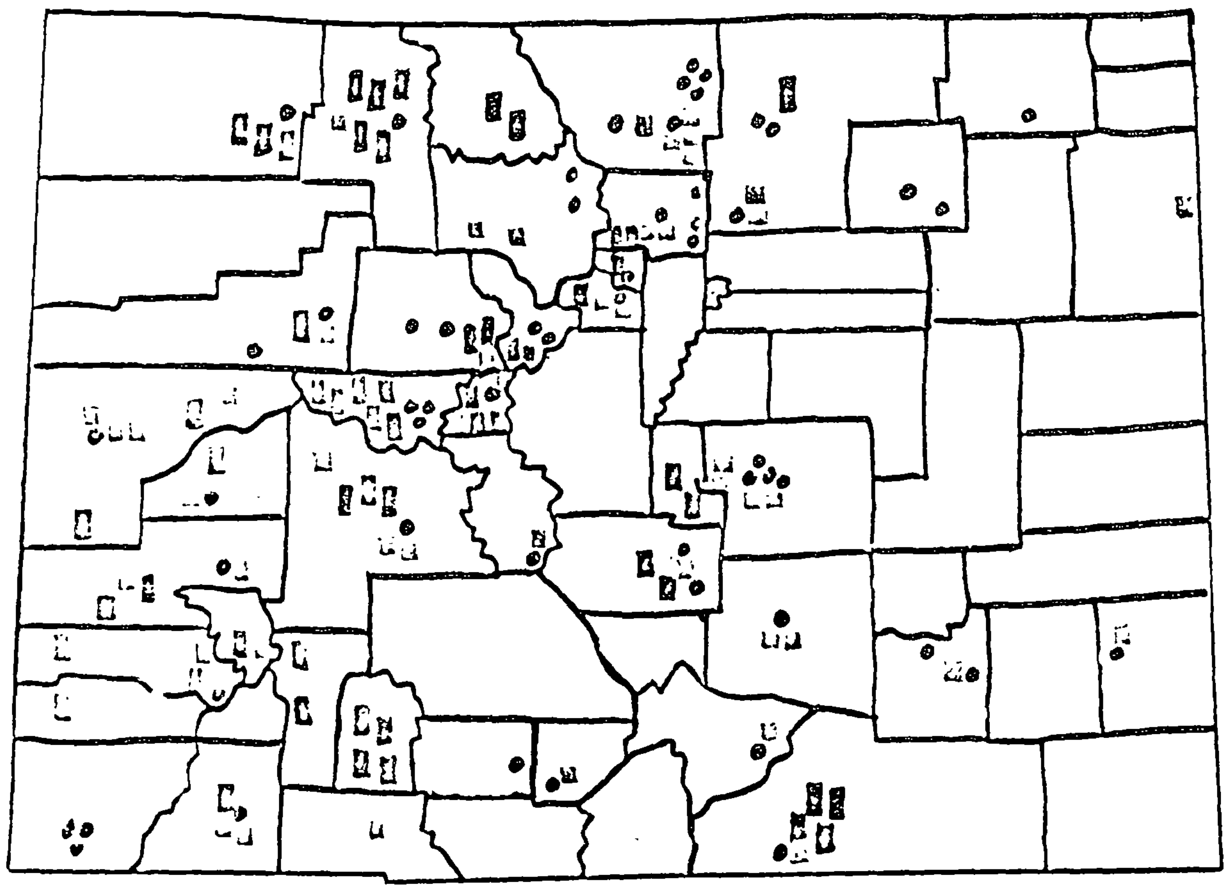
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
:omach	Northeast	Logan	Highly Sig.	M
	Southeast	Las Animas, Conejos	"	M
	South Central	Huerfano, Rio Grande	"	F
liary Passages & Liver	Southeast	Las Animas	"	F
:ncreas	West Central	Mesa	"	M
:ain and Other Parts of :rvous System	North Central	Boulder	Significant	F
ther & Unspecified Sites	South Central	Rio Grande	Highly Sig.	F
ervix Uteri	Southeast	Bent	"	F
	South Central	Huerfano	"	F
	North Central	Clear Creek	"	F
.ip	Metro-Denver	Denver, Jefferson, Adams Arapahoe	Significant	F
'asopharynx	Metro-Denver	Denver, Jefferson, Adams Araphahoe	Highly Sig.	F
.ye	Northeast	Phillips, Yuma, Kit Carson Cheyenne, Elbert	Highly Sig.	F
	East Central	Washington, Lincoln, Douglas	"	F
	North Central	Larimer, Weld, Logan	"	M
	Northeast	Sedgwick, Morgan	"	M
)ther Endocrine Glands	Metro-Denver	Jefferson	Significant	F
	Northwest	Moffat, Routt, Jackson	Significant	F
	North Central	Rio Blanco, Grand	Significant	F
	Central	Garfield, Eagle, Summit, Clear Creek, Gilpin, Teller, Park, Chaffee, Lake, Gunnison, Pitkin, Ouray, San Juan, Hinsdale, Mineral, Weld, Morgan	Significant	F

COLORADO Con't

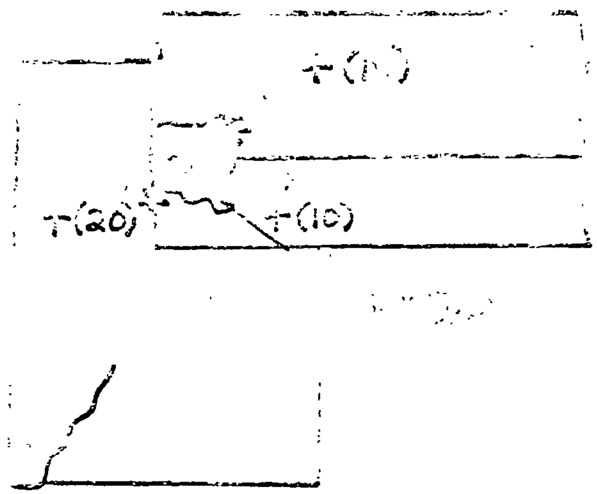
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
'onnective Tissue	Metro-Denver	Denver, Jefferson, Adams Arapahoe	Significant	M/F
odgkin's Disease	Central	El Paso	Highly Sig.	M
ymphosarcoma & eticulosarcoma, Etc.	Metro-Denver	Denver, Jefferson, Adams Arapahoe	Significant Highly Sig.	M F
'estis	Metro-Denver	Denver, Jefferson, Adams Arapahoe	Significant	M



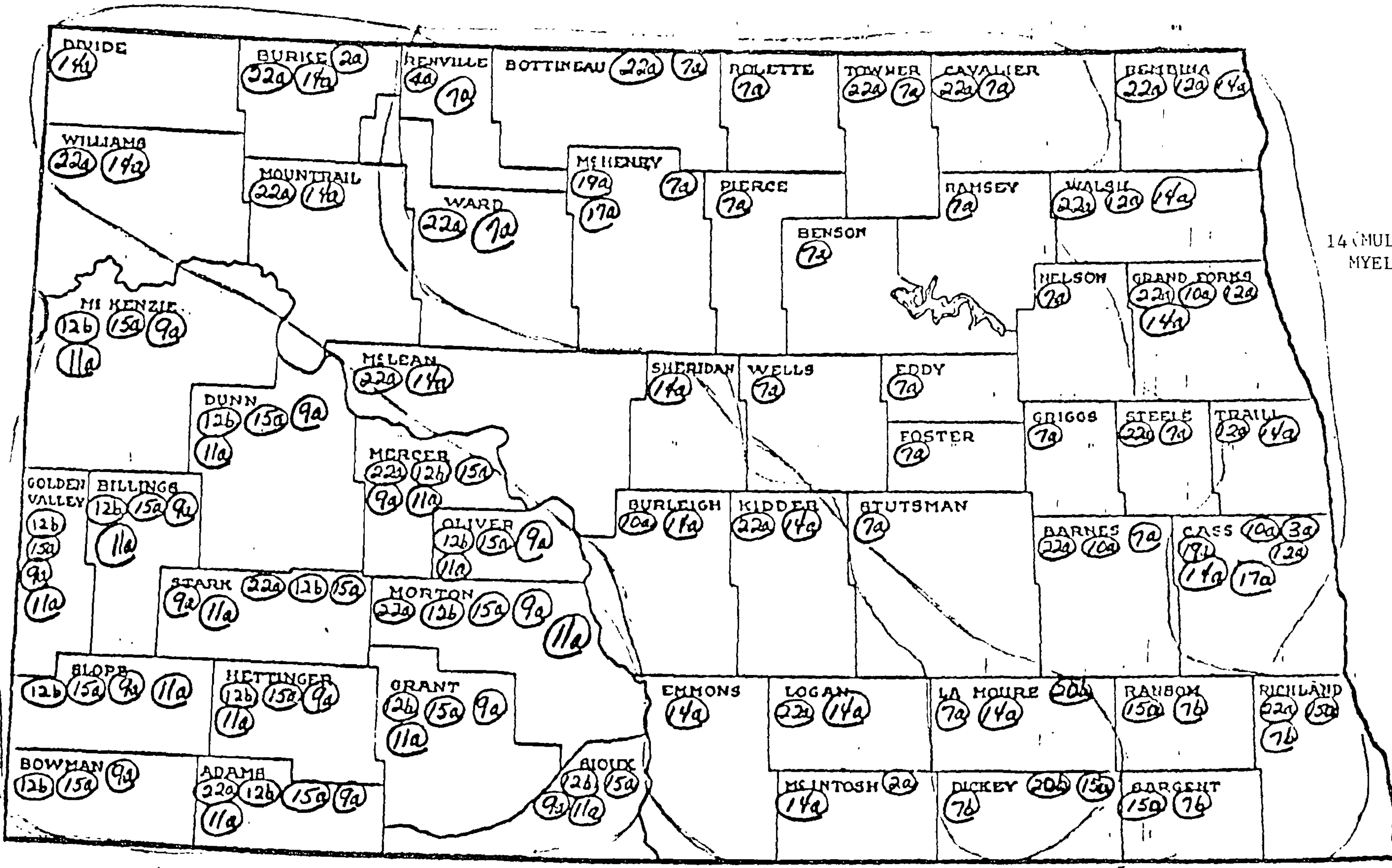
COLORADO



COLORADO



DENVER



14 (MULTIPLE MYELOMA)

11 (LEUKEMIA)

12 (LIP)

15 (NASOPHARYNX)

NORTH DAKOTA

14 (MULTIPLE MYELOMA)

7 (ENDOCRINE GLANDS)

22 (STOMACH)

NORTH DAKOTA

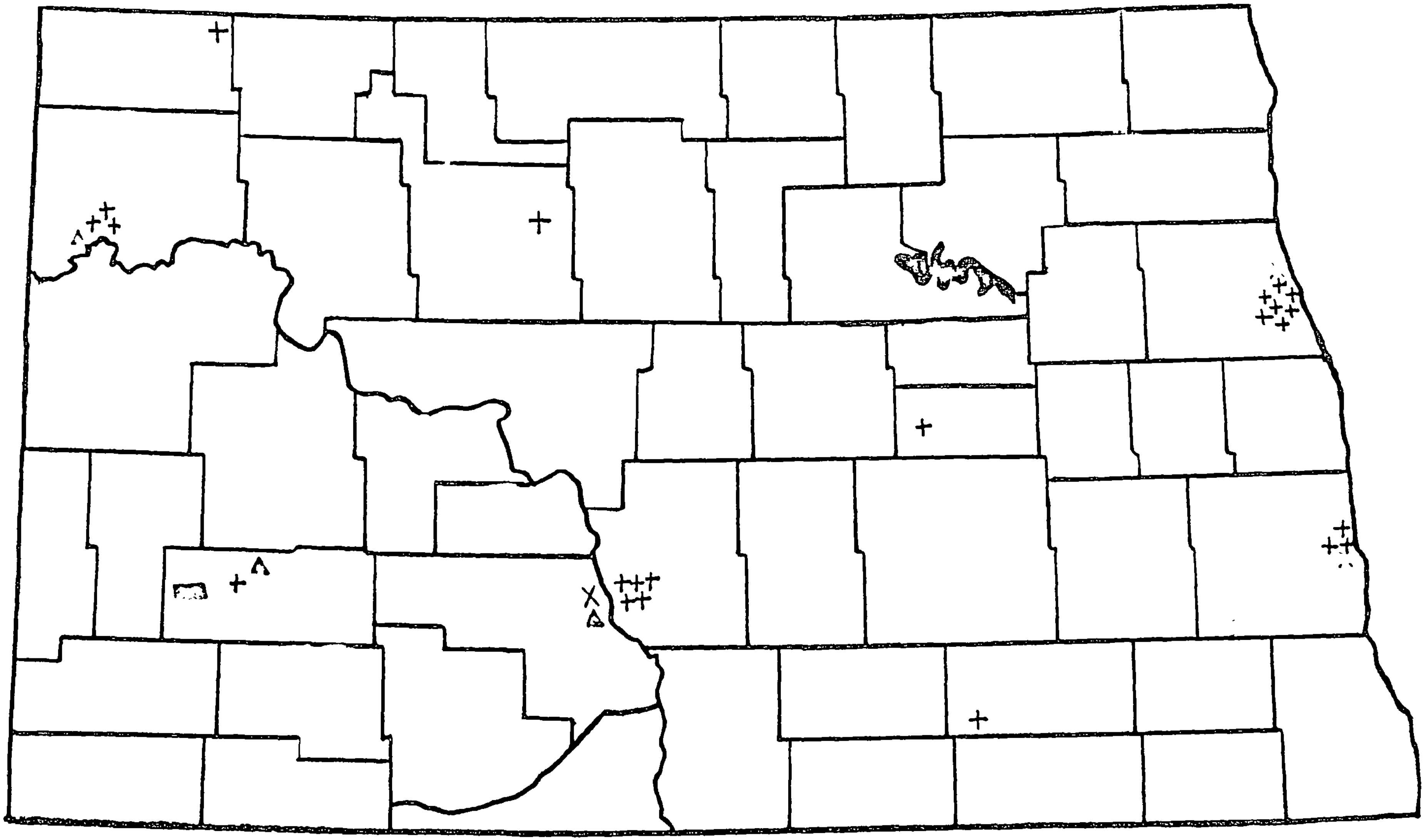
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
Stomach	Northwest	Williams, Burke, Mountrail Ward	Highly Sig.	M
	Northeast	Burke, Bottineau,	"	F
		Pembina, Walsh	"	M
		Towner, Cavalier, Grand Forks	"	F
	East Central	Steele, Barnes	"	M
		Barnes	"	F
	South Central	Logan	"	M
		Kidder	"	F
	Southeast	Richland	"	M/F
	Southwest	Adams	"	M
	West Central	Stark, Mercer, Morton	"	M
		McLean, Stark	"	F
Rectum	Southeast	Dickey, La Moure	Significant	M
Biliary Passages & Liver	Northwest	Burke	Highly Sig.	F
	South Central	McIntosh	"	F
Kidney	Northeast	Grand Forks	"	M
	East Central	Cass	"	M
		Barnes	"	F
	Central	Burleigh	"	F
Brain & Other Parts of Nervous System	East Central	Cass	"	F
Breast	North Central	Renville	"	F
Ovary	East Central	Cass	"	F
	North Central	McHenry	"	F

NORTH DAKOTA Con't

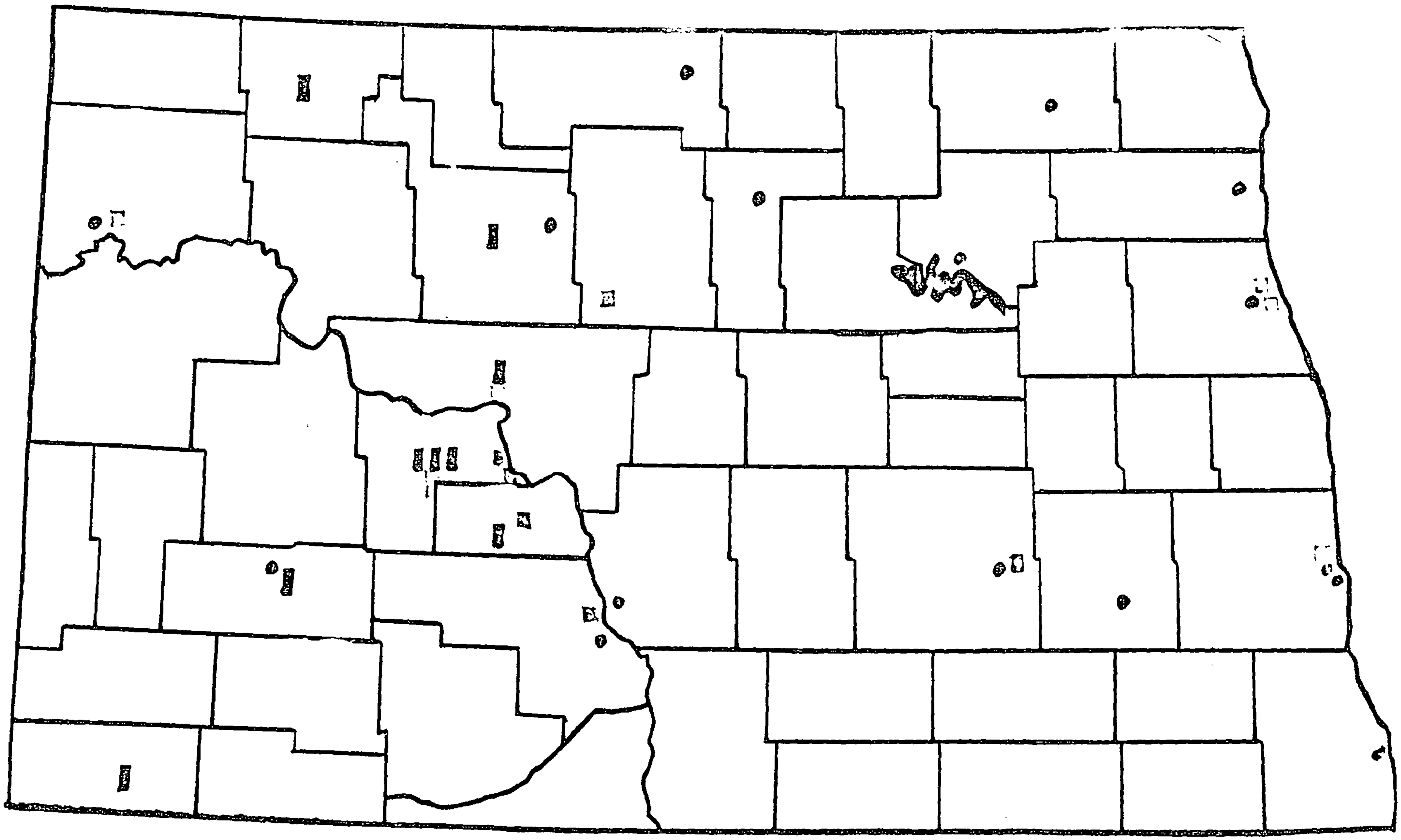
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
Prostrate	East Central	Cass	Highly Sig.	M
	North Central	McHenry	"	M
Lip	Northeast	Pembina, Walsh, Grand Forks, Traill, Cass	"	M
	West Southwest	Sioux, Grant, Morton, Oliver Mercer, Dunn, Stark, Hettinger Adams, Bowman, McKenzie, Billings, Golden Valley, Slope	Significant	M
Nasopharynx	West Southwest	Sioux, Grant, Morton, Oliver Mercer, Dunn, Stark, Hettinger, Adams, Bowman, McKenzie, Billings Golden, Valley, Slope	Highly Sig.	F
	Southeast	Richland, Ransom, Sargent Dickey	"	F
Other Endocrine Glands	North Central Central	Cavalier, Ramsey, Nelson, Renville, Steele, Barnes, La Moure, Griggs, Stuttsman, Wells, Foster, Eddy, Bottineau, McHenry, Rollette, Towner, Pierce, Benson, Ward	"	M
	Southeast	Richland, Ranson, Sargent, Dickey	Significant	F
Hodgkin's Disease	Southwest	Sioux, Grant, Morton, Oliver Mercer, Dunn, Stark, Hettinger, Adams, Bowman, McKenzie, Billings, Golden Valley, Slope	Highly Sig.	F
Multiple Myeloma	Northeast	Pembina, Walsh, Grand Forks, Traill, Cass	"	M

NORTH DAKOTA Con't

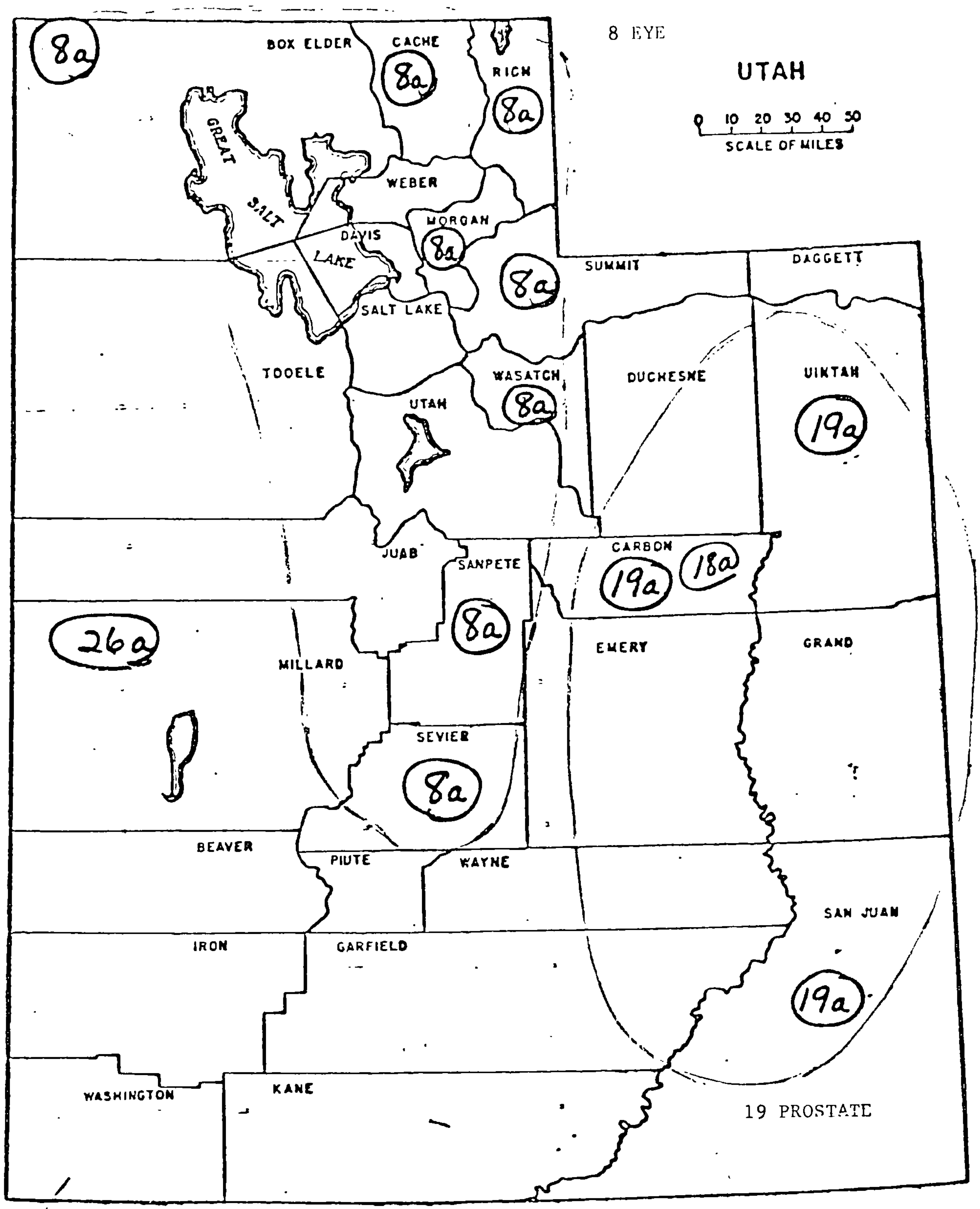
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
ultiple Myeloma	Northwest Central South Central	Divide, Williams, Burke, McLean, Mountrail, Sheridan La Moure, Burleigh, Kidder, Emmons, Logan, McIntosh	Highly Sig.	F
ukemia	Southwest	Sioux, Grant, Morton, Oliver, Mercer, Dunn, Stark, Hettinger, Adams, Bowman, McKenzie, Billings, Golden Valley, Slope	"	M



NORTH DAKOTA



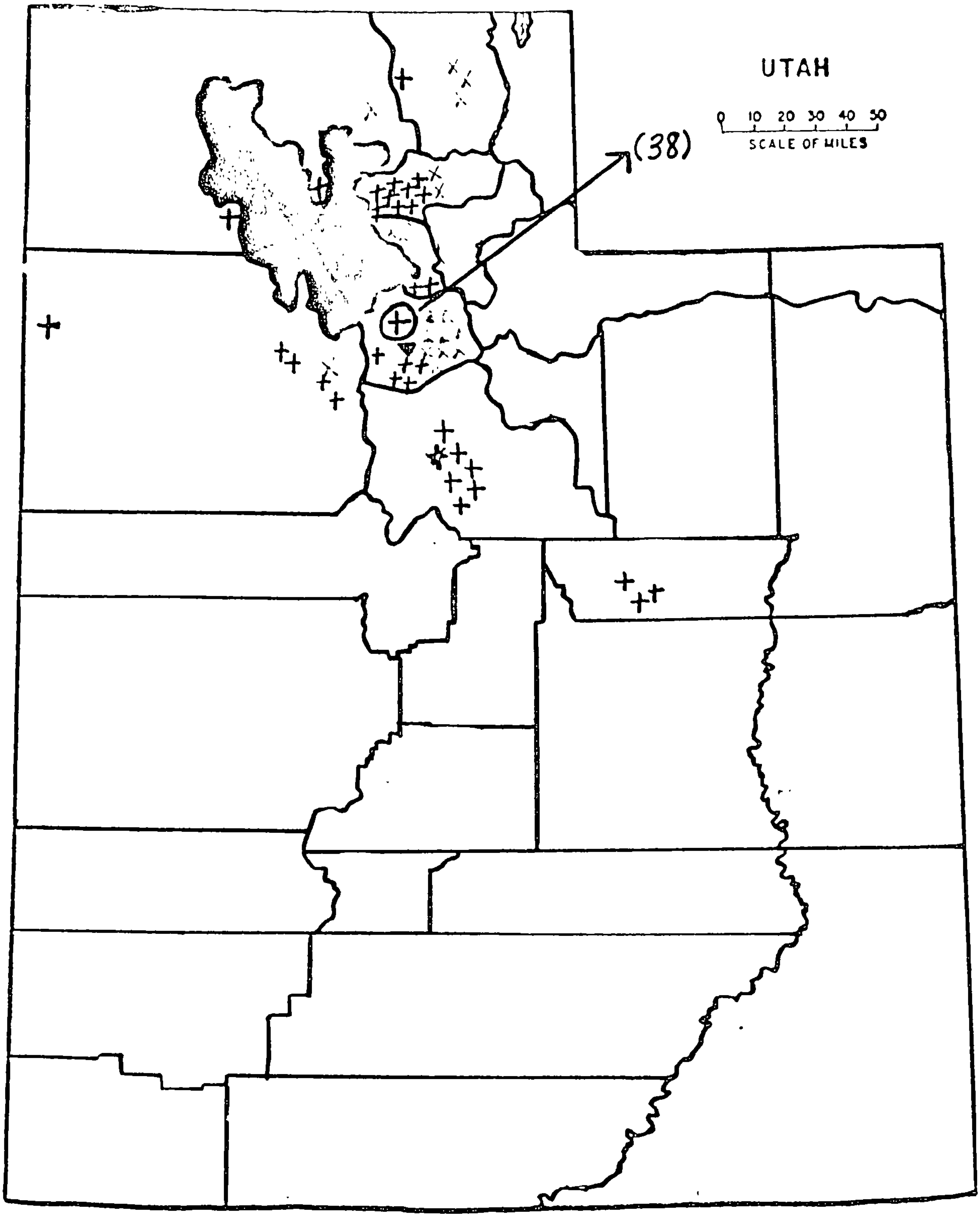
NORTH DAKOTA

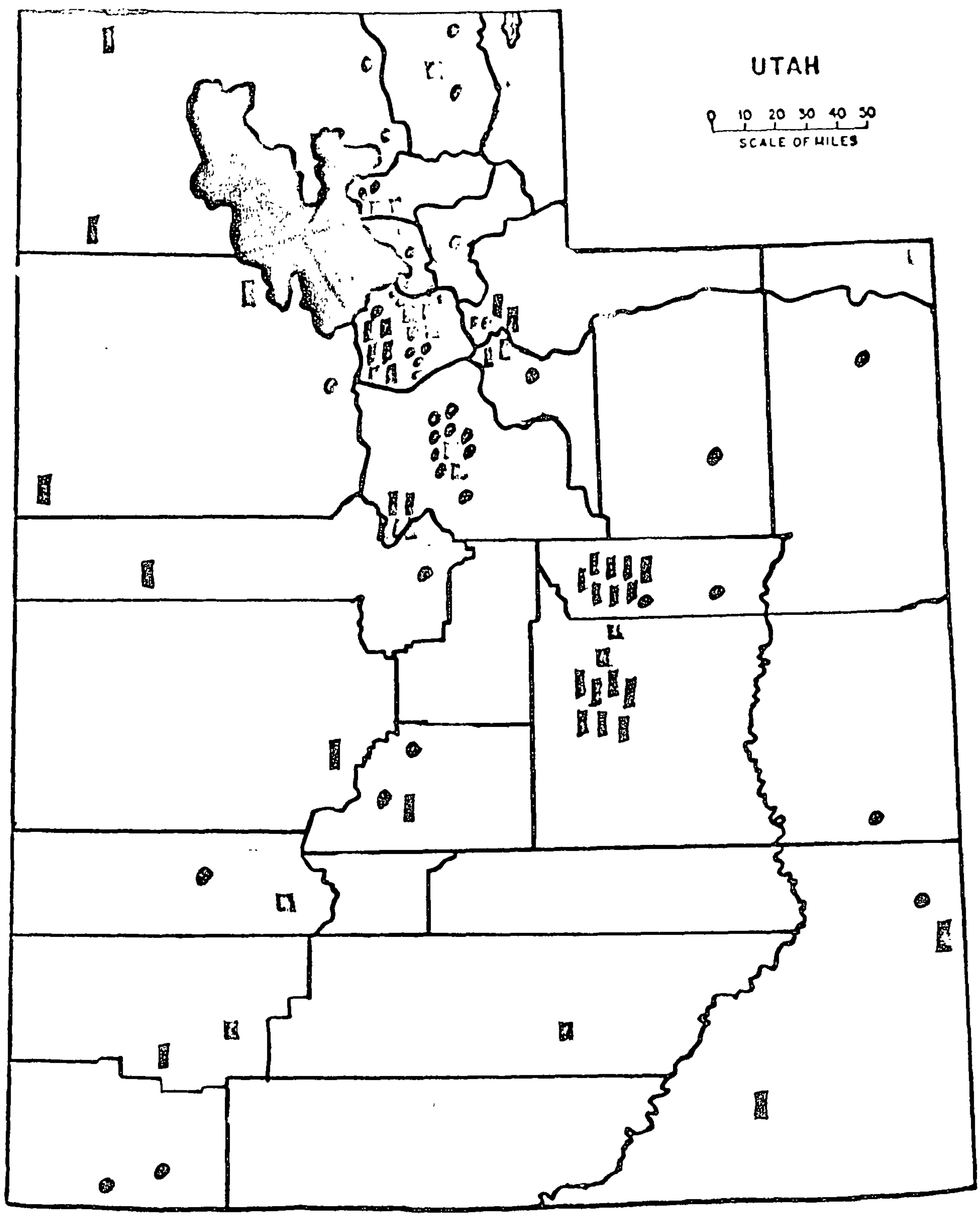


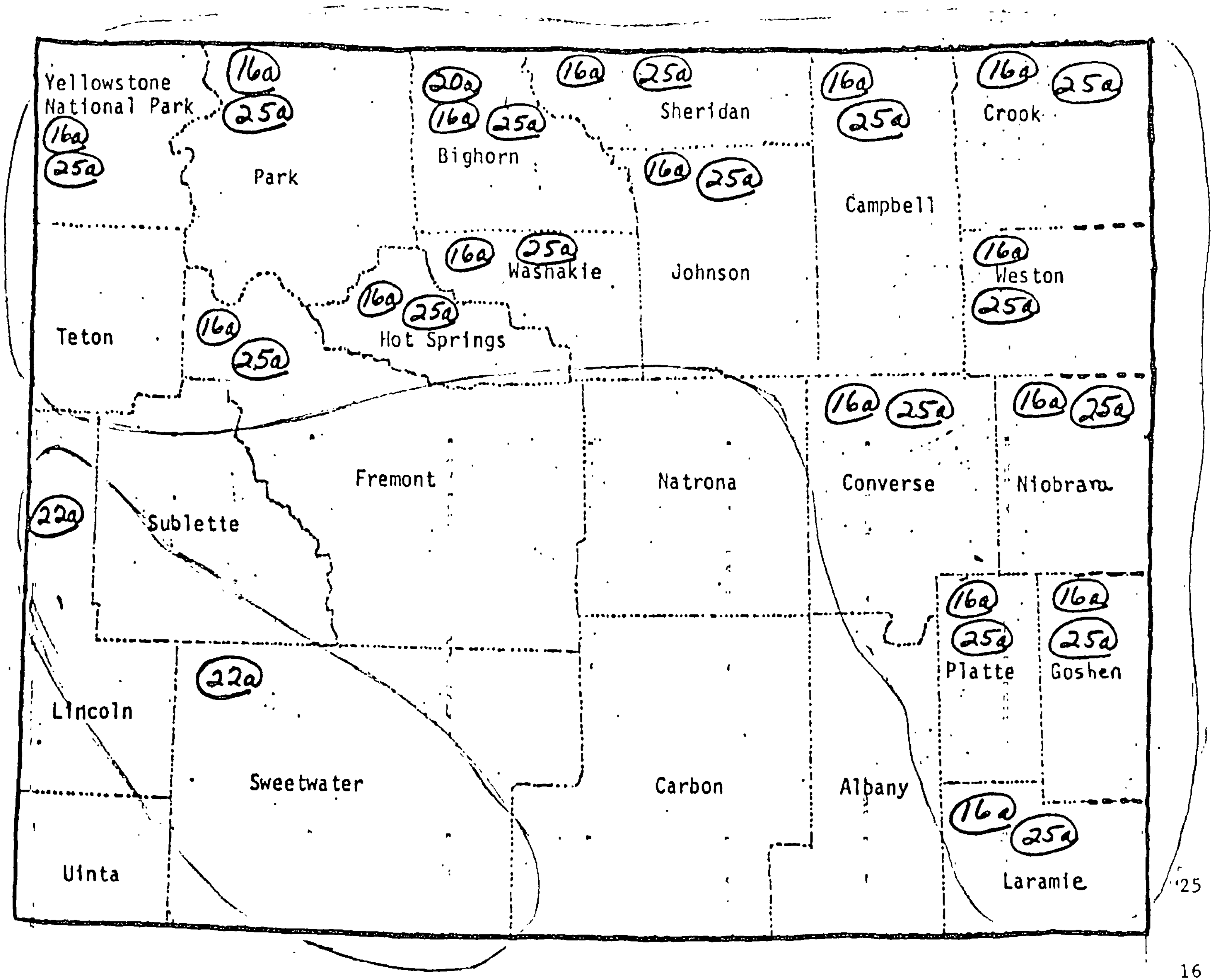
Note the absence
of Leukemia here

UTAH

Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
Prostrate	Southeast	San Juan	Highly Significant	M
	Northeast	Uintah, Carbon	Highly Significant	M
Eye	Northwest North Central Central	Box Elder, Cache, Rich, Morgan, Summit, Wasatch, San Pete, Sevier	Highly Significant	F
Pancreas	East Central	Carbon	Highly Significant	M
Other, and Unspecified Sites	West Central	Millard	Highly Significant	F


UTAH
0 10 20 30 40 50
SCALE OF MILES
(38)


UTAH
0 10 20 30 40 50
SCALE OF MILES



25 (THYROID GLAND)

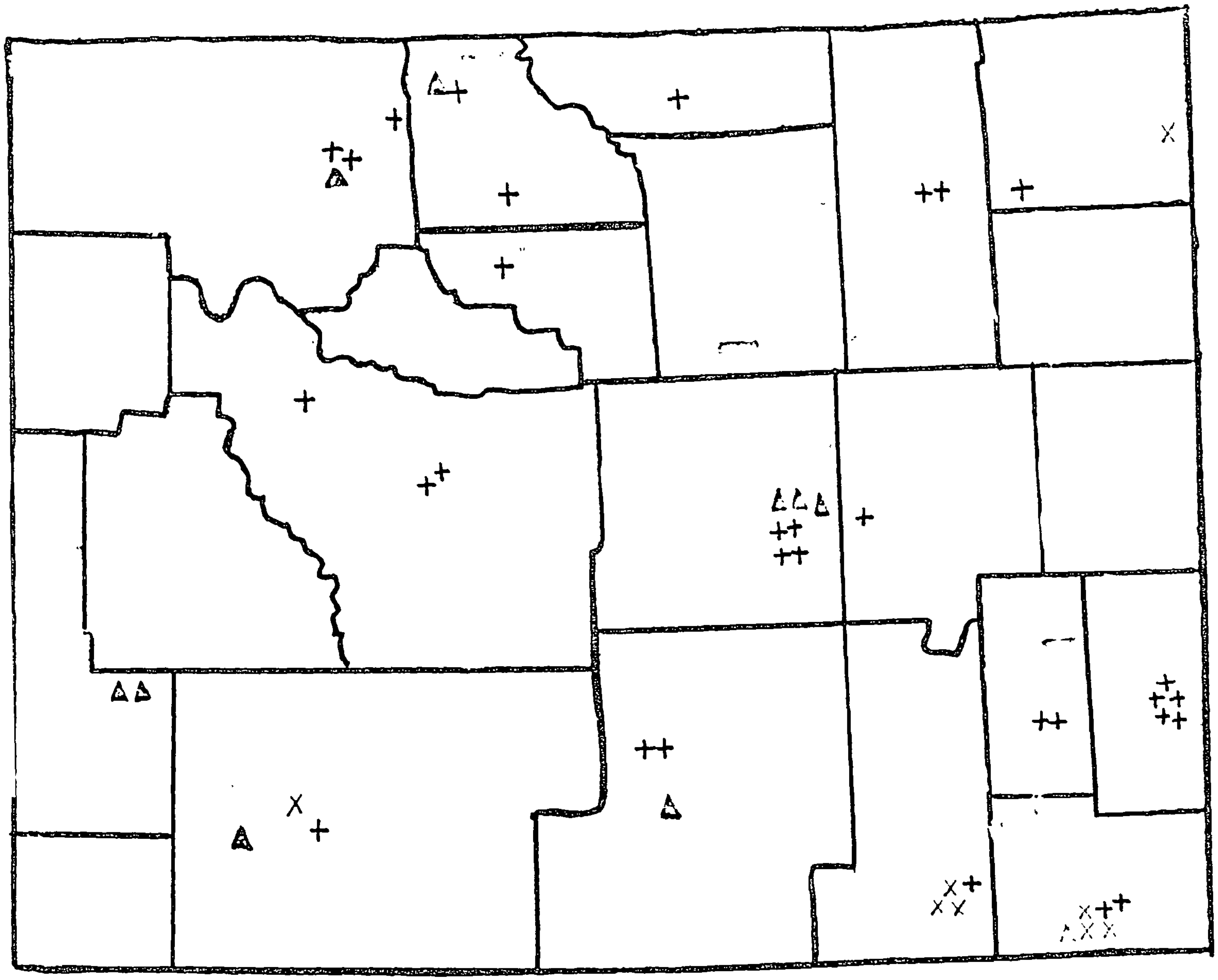
16 (NOSE,NASAL)

22 STOMACH

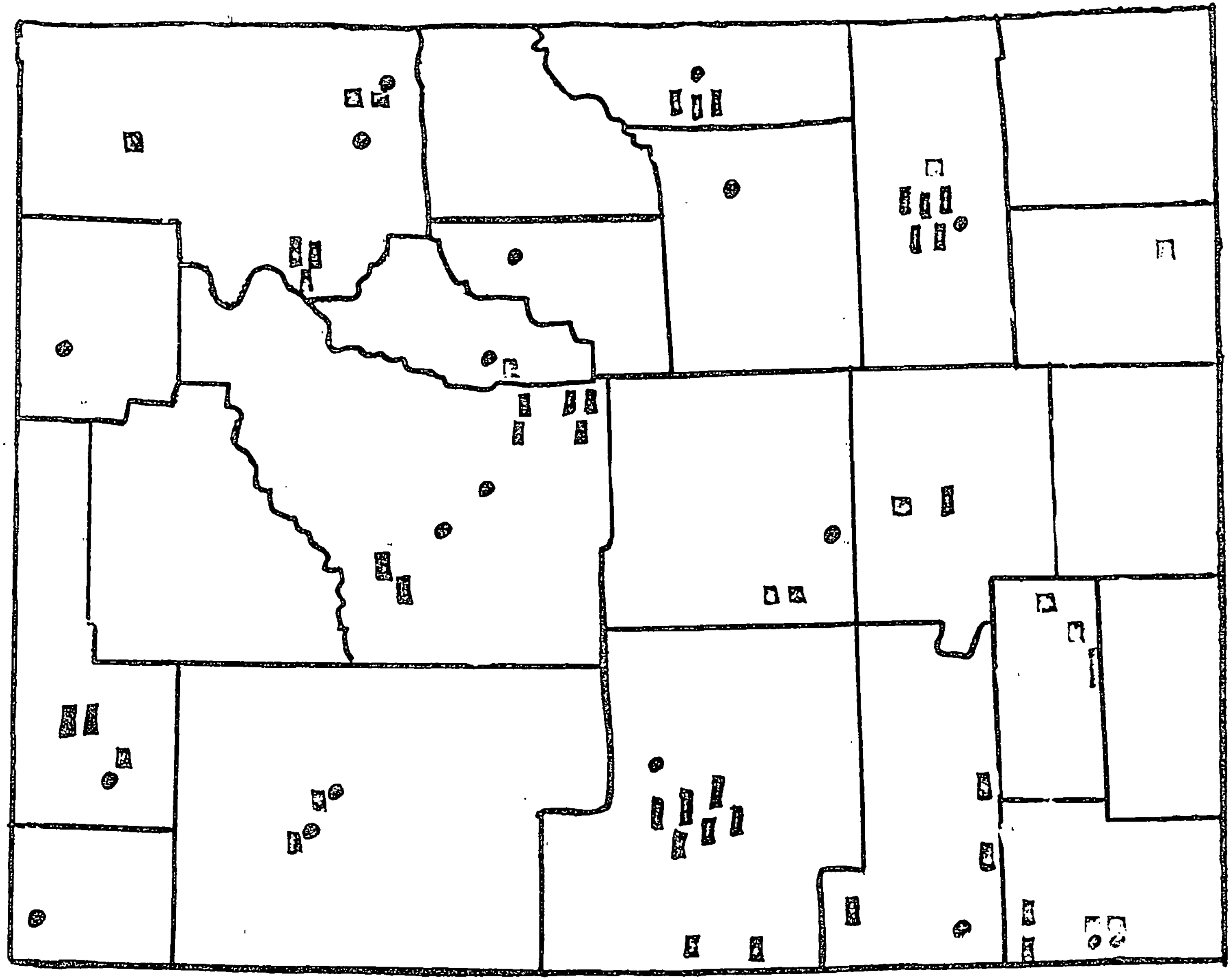
WYOMING

<u>WYOMING</u>

Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
Stomach	West	Lincoln	Highly Significant	M
	Southwest	Sweetwater	Highly Significant	M
Rectum	North Central	Big Horn	Highly Significant	M
Nose, Nasal Cavities & Sinuses	Northwest North Central Northeast East Central Central Southeast	Yellowstone National Park, Fremont, Hot Springs, Park, Washakie, Big Horn, Sheridan, Johnson, Campbell, Crook, Weston, Converse, Niobrara, Platte, Goshen, Laramie	Highly Significant	M
Thyroid Gland	Northwest North Central Northeast East Central Central Southeast	Yellowstone National Park, Fremont, Hot Springs, Park, Washakie, Big Horn, Sheridan Johnson, Campbell, Crook Weston, Converse, Niobrara, Platte, Goshen, Laramie	Highly Significant	M

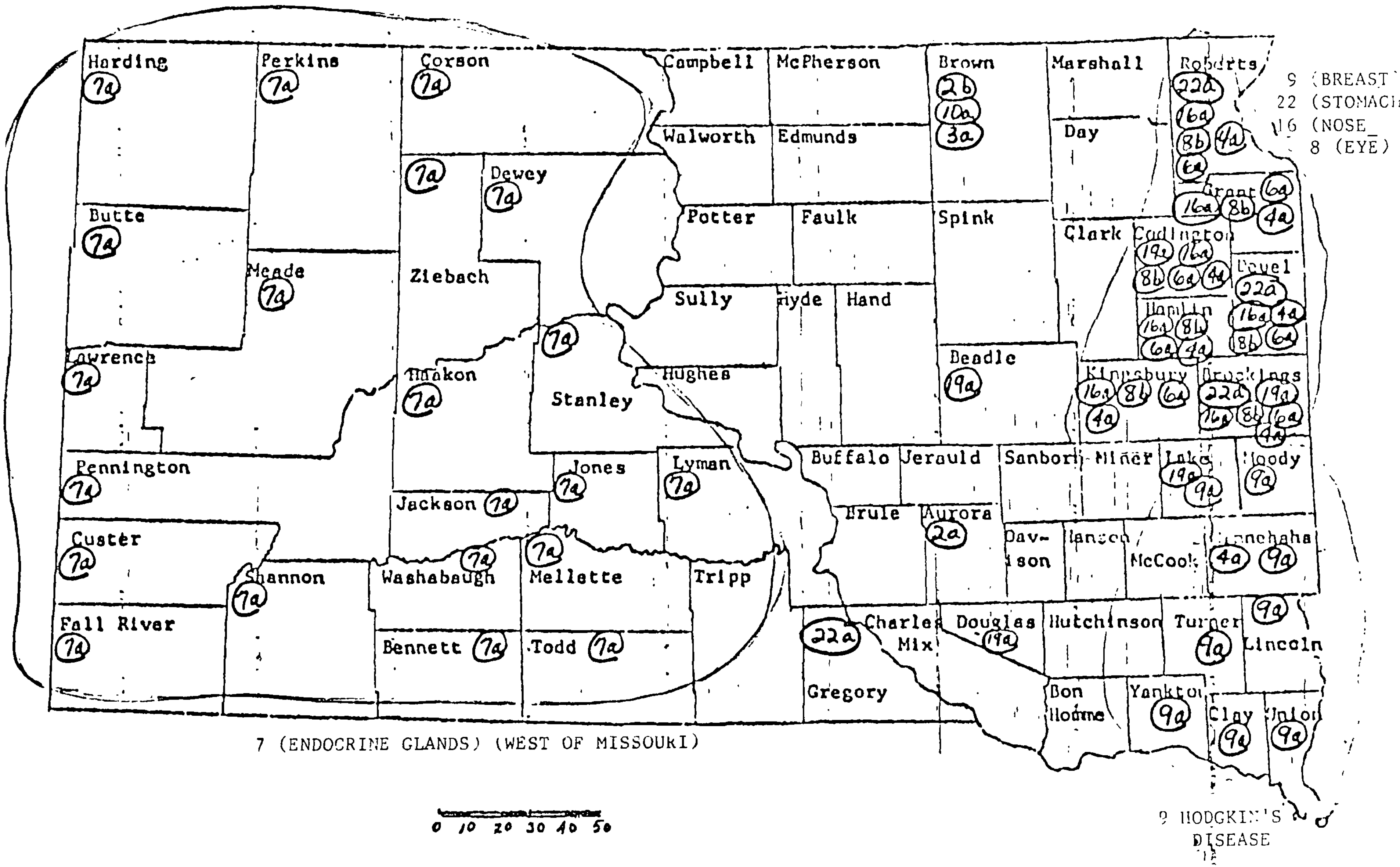


WYOMING



WYOMING

SOUTH DAKOTA

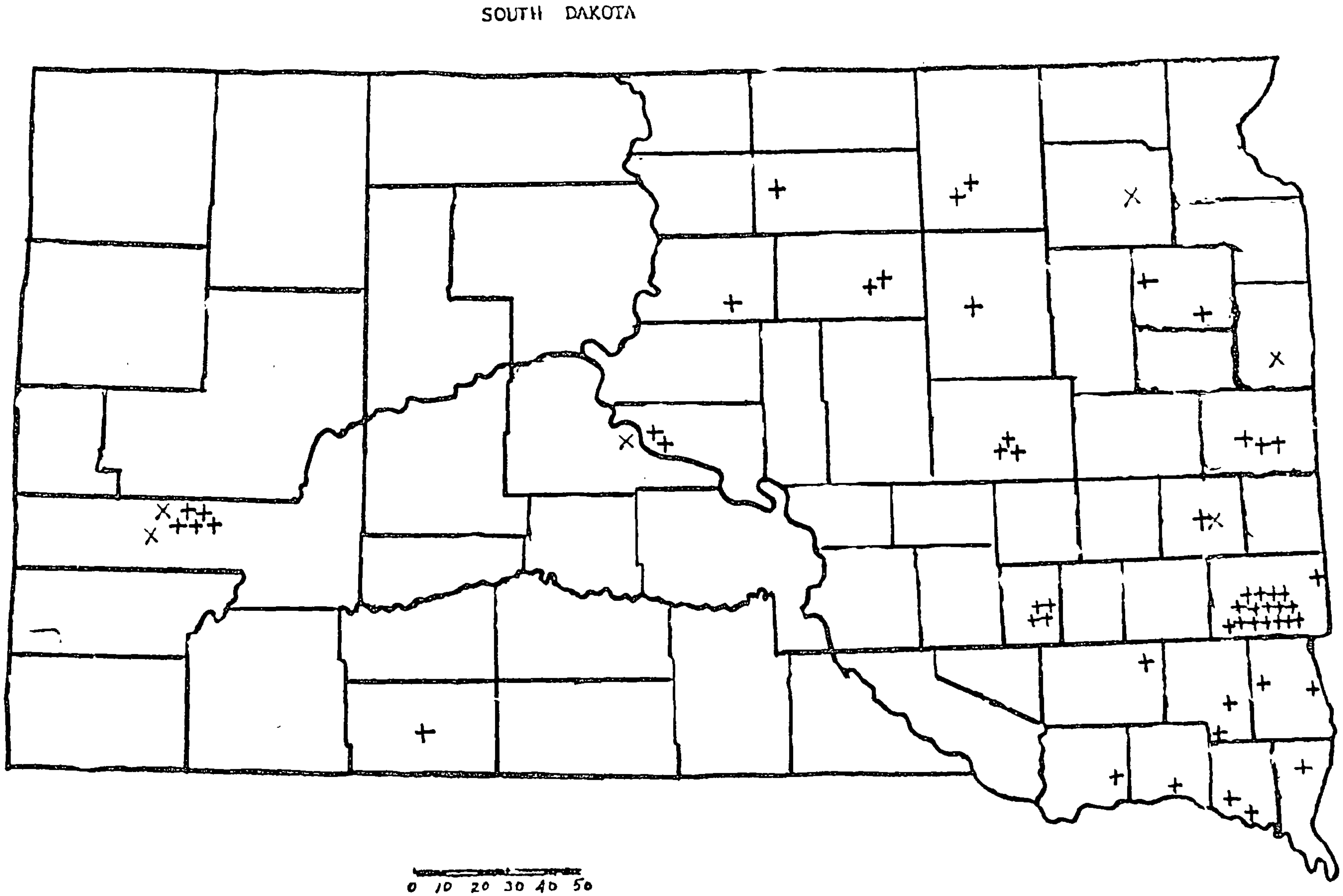


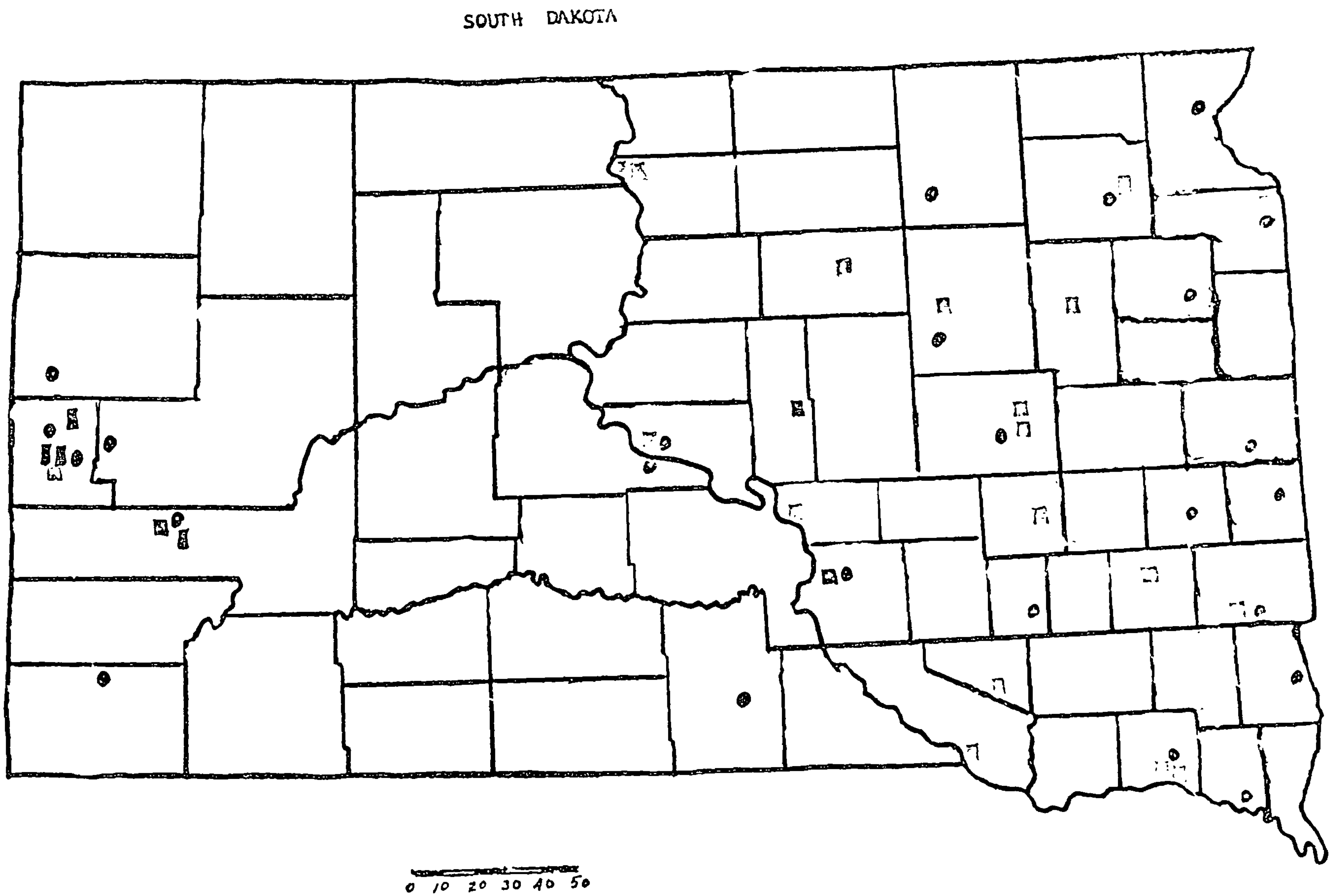
SOUTH DAKOTA

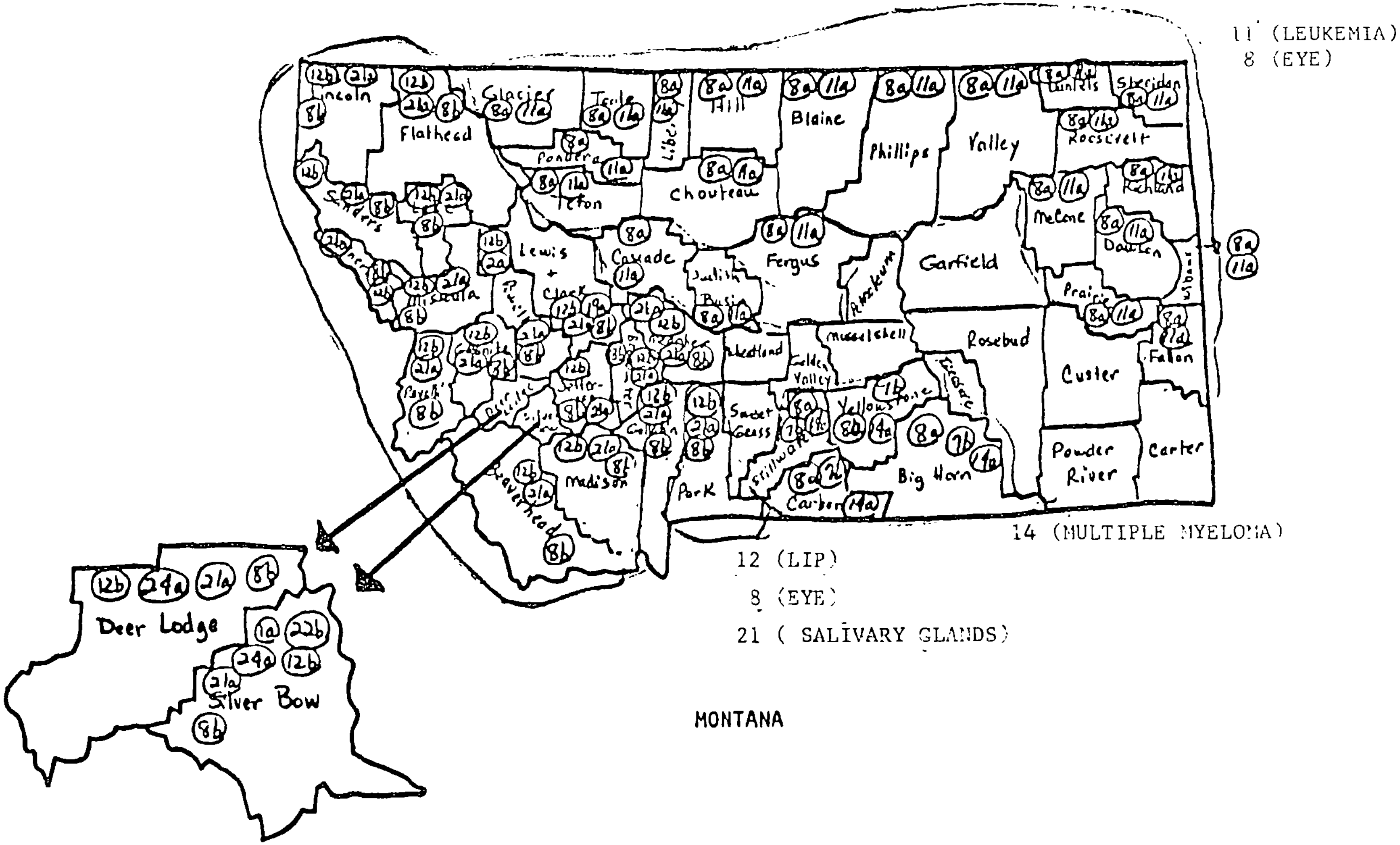
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
Stomach	Northeast	Roberts, Deuel, Brookings	Highly Sig.	M
	South Central	Gregory	"	M
Biliary Passages & Liver	Northeast	Brown	Significant	F
	South Central	Aurora	Highly Sig.	F
Kidney	Northeast	Brown	"	F
Brain & Other Parts of Nervous System	Northeast	Brown	"	M
Breast	Southeast	Minnehaha	"	F
Prostrate	East Central	Codington, Brookings, Lake Beadle	"	M
	Southeast	Douglas	"	M
Nose, Nasal Cavities, and Sinuses	Northeast East Central	Roberts, Grant, Deuel, Brookings Kingsbury, Hamlin, Codington	"	F
Eye	Northeast East Central	Roberts, Grant Deuel, Brookings, Kingsbury, Hamlin, Codington	Significant	F
Other Endocrine Glands	West North and South Central	Harding, Perkins, Corson, Dewey, Stanley, Lyman, Todd Mellette, Jones, Bennett, Jackson, Washabaugh, Shannon, Fall River, Custer, Pennington, Haakon, Meade, Lawrence, Butte, Ziebach	Highly Sig.	M

SOUTH DAKOTA Con't

Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
Connective Tissue	Northeast East Central	Roberts, Grant, Codington, Deuel, Hamlin, Kingsbury, Brookings	Highly Sig.	F
Hodgkin's Disease	East Central Southeast	Moody, Lake, Minnehaha, Lincoln, Union, Clay, Turner, Yankton	"	M
Breast	Northeast East Central	Roberts, Grant Codington, Deuel, Hamlin Kingsbury, Brookings	"	M


SOUTH DAKOTA
0 10 20 30 40 50


SOUTH DAKOTA
0 10 20 30 40 50

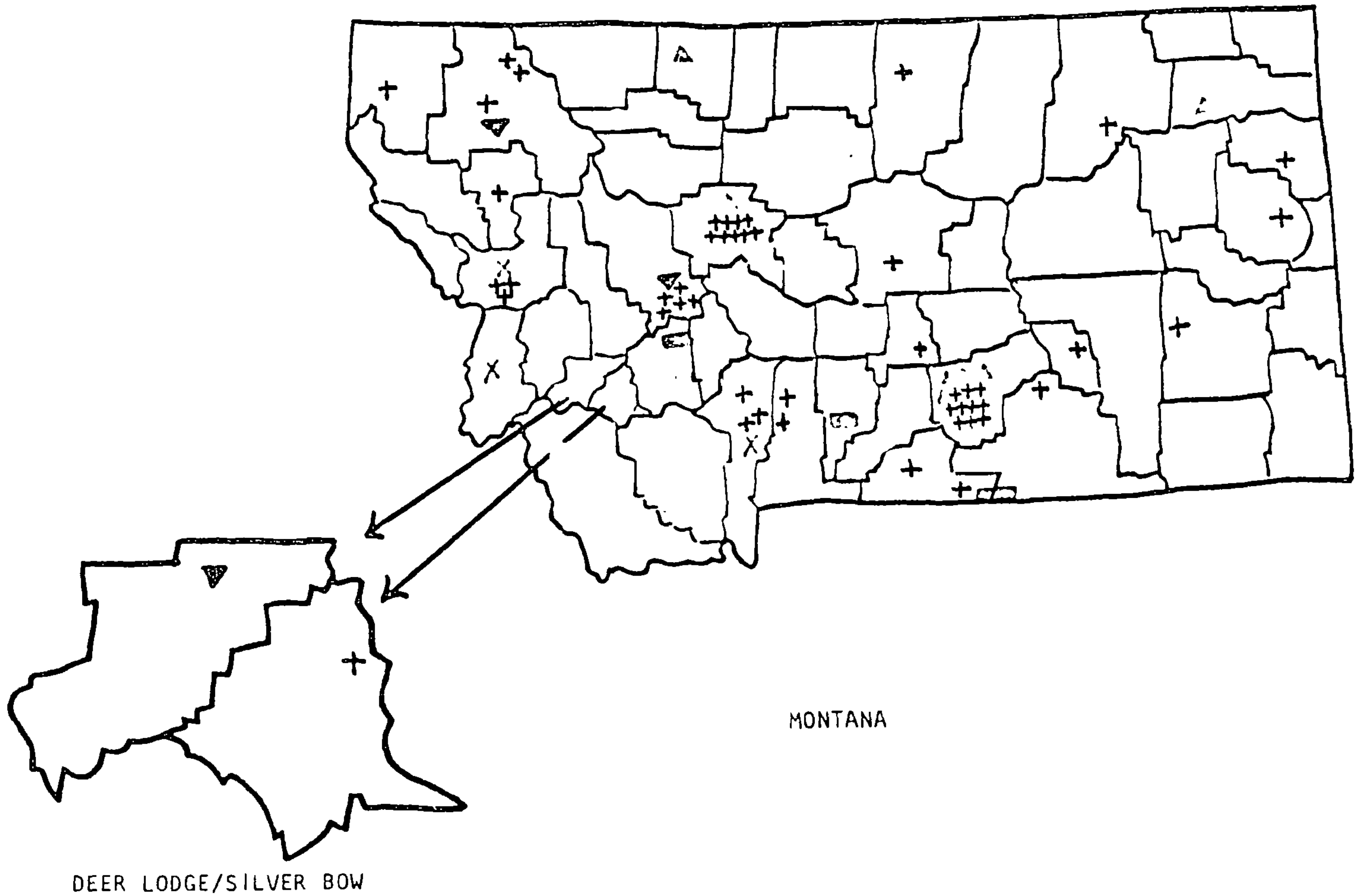

11 (LEUKEMIA)
8 (EYE)
14 (MULTIPLE MYELOMA)
12 (LIP)
8 (EYE)
21 (SALIVARY GLANDS)
Lincoln
Flathead
Glacier
Toole
Hill
Blaine
Phillips
Valley
Daniels
Sheridan
Roosevelt
Pondera
Teton
Chouteau
Richland
McCone
Sanders
Lake
Lewis + Clark
Cascade
Fergus
Garfield
Dawson
Missoula
Prairie
Wibaux
Judith Basin
Petroleum
Musselshell
Rosebud
Custer
Fallon
Wheatland
Golden Valley
Yellowstone
Treasure
Sweet Grass
Stillwater
Big Horn
Powder River
Carter
Carbon
Park
Gallatin
Madison
Beaverhead
Deer Lodge
Silver Bow
MONTANA

MONTANA

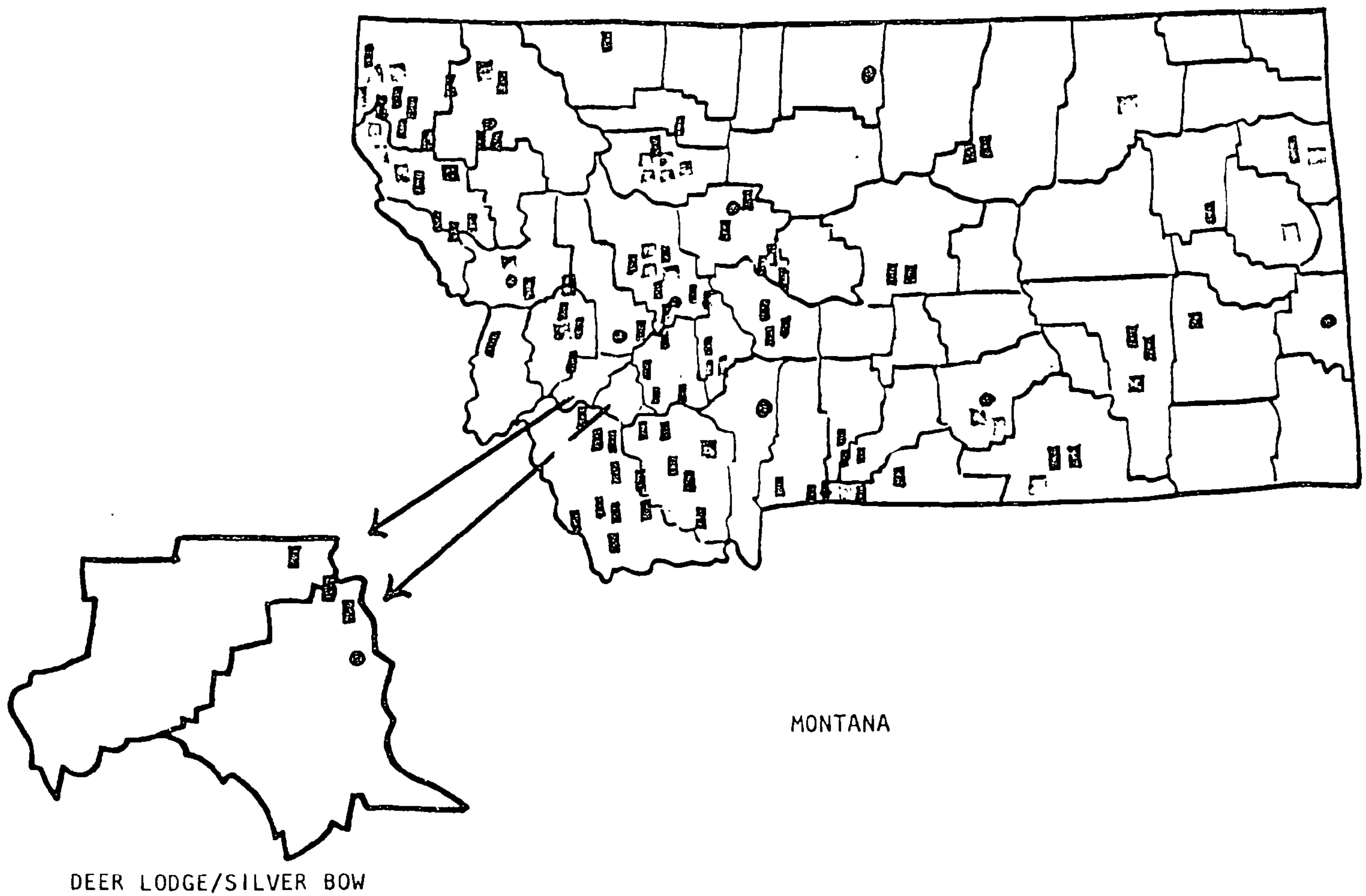
Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
All sites combined	Southwest	Silver Bow	Highly Sig.	M
Stomach	Southwest	Silver Bow	Significant	M
Biliary Passages & Liver	West Central	Powell	Highly Sig.	M
Trachea, Bronchus & Lung	Southwest	Silver Bow, Deer Lodge	Highly Sig.	M
Other & Unspecified Sites	Central	Meagher	"	F
Prostrate	West Central	Lewis & Clark	"	M
Lip	Northwest West Central Southwest	Park, Meagher Flathead, Lincoln, Sanders, Lake, Powell, Lewis & Clark, Broadwater, Gallatin, Madison, Jefferson, Silver Bow, Deer Lodge, Beaverhead, Granite, Missoula, Mineral, Ravalli	Significant	F
Salivary Glands	Northwest West Central Southwest	Park, Meagher, Flathead Lincoln, Sanders, Lake, Powell, Lewis & Clark, Broadwater, Gallatin, Madison Jefferson, Silver Bow, Deer Lodge, Beaverhead, Granite, Missoula, Mineral, Ravalli	Highly Sig.	F
Eye	Northeast North Central Central	Glacier, Toole, Liberty, Hill Blaine, Phillips, Valley Daniels, Sheridan, Roosevelt, Richland, Wibaux, Fallon, Prairie, Dawson, McCone, Fergus, Teton, Pondera, Chouteau, Cascade, Judith Basin	"	F
	South Central	Big Horn, Carbon, Still Water	Highly Sig.	M
		Yellowstone	Significant	F

MONTANA Con't

Cancer Site	Area Affected	Counties Affected	Significance	(White) Population Affected
'e	Northwest West Central Southwest	Park, Meagher, Flathead Lincoln, Sanders, Lake Powell, Lewis & Clark, Broadwater, Gallatin, Madison, Jefferson, Silver Bow, Deer Lodge, Beaverhead, Granite, Missoula, Mineral, Ravalli	Significant	M
.her Endocrine Glands	South Central	Big Horn, Carbon, Still Water Yellowstone	Significant	M
ıltiple Myeloma	South Central	Big Horn,Carbon, Still Water Yellowstone	Highly Sig.	M
›ukemia	Northeast North Central Central	Glacier, Toole, Liberty, Hill, Blaine, Phillips, Valley, Daniels, Sheridan, Roosevelt, Richland, Wibaux, Fallon, Prairie, Dawson, McCone, Fergus, Teton, Pondera, Chouteau, Cascade, Judith Basin	Highly Sig.	F



MONTANA
DEER LODGE/SILVER BOW


DEER LODGE/SILVER BOW
MONTANA

K Jansen, 9A11

Addressee

ENVIRONMENTAL PROTECTION AGENCY

TRANSMITTAL

R8 2070.1

APPENDIX E

Region VIII

January 22, 1979

EMERGENCY PROGRAMS - ENVIRONMENTAL EMERGENCIES

MATERIAL TRANSMITTED:

Regional Order R8 2070.1, Region VIII, Emergency Response Plan.

MATERIAL SUPERSEDED:

None.

FILING INSTRUCTIONS:

File the attached material in a three ring binder established for the Region VIII Directives System.

Alan Merson
Regional Administrator

Dist: 2:Emergency Response Team

ENVIRONMENTAL

PROTECTION

AGENCY

ORDER

R8 2070.1

January 22, 1979

Region VIII

EMERGENCY PROGRAMS - ENVIRONMENTAL EMERGENCIES

REGION VIII ENVIRONMENTAL EMERGENCY RESPONSE PLAN

1. PURPOSE. This Order establishes the Emergency Response Plan and assigns responsibility for implementing the Plan.

2. AUTHORITY. EPA authority to respond to a variety of situations that pose a real or imminent hazard to public health and safety or the environment is contained in the following Public Laws: Clean Air Act; Clean Water Act; Safe Drinking Water Act; Resource Conservation and Recovery Act; Federal Insecticide, Fungicide, and Rodenticide Act; and Toxic Substances Control Act.

3. SCOPE. This Plan applies to all environmental emergencies occurring within EPA Region VIII. Such emergencies may involve discharges of oil into waters of the United States or release of toxic chemicals or hazardous substances into the environment. The Plan is limited to emergency response activities; i.e. those immediate actions required to protect public health and safety or the environment. The resolution of non-emergency problems will be handled with the non-emergency authorities of the Public Laws described in Paragraph 2. The Plan supplements EPA-wide emergency procedures and directives and other Regional emergency plans including the Oil & Hazardous Substances Pollution Contingency Plan (OHSPCP), the Air Pollution Episode Avoidance Plan, the Disaster Assistance Coordination Manual, and the Emergency Readiness Manual. This Plan does not supersede the above mentioned plans, procedures, or directives.

4. PROCEDURES.

a. Duty Officer. The Chief or Acting Chief of the Emergency Planning and Response Branch (EPRB) in the Surveillance and Analysis Division serves as the duty officer during normal working hours. During other than normal working hours during the week, the EPRB Chief will designate a standby duty officer for each day in order to maintain 24-hour coverage of the emergency reporting telephone line.

b. On-scene Coordinator (OSC). The OSC is the designated person in charge of the EPA response at the scene of an environmental emergency. The OSC is designated by the EPRB Chief.

c. PROGRAM AREA REPRESENTATIVES. Principal and alternate representatives of regional programs are designated in Attachment 1 to supplement the EPRB staff

Dist: 2: Emergency Response Team | Initiated by: EPRB during an environmental emergency. Any or all designated program representatives may become a part of the EPRB staff during an environmental emergency and function under the direction and supervision of the OSC. The list of assigned personnel will be reviewed periodically and adjusted as necessary.

d. Response Activation. Upon receipt of a report that oil has been spilled into United States' waters, or that a toxic substance or hazardous material has been released into the environment, the duty officer has three options:

(1) If the size of the spill or release and the resulting hazard to human health and the environment is such that EPA response is not necessary or warranted, the duty officer will so inform the caller. EPA response may not be necessary if adequate response will be provided by another government agency. A record will immediately be made of the call including the date and time; name, title, and location of the caller; location of the spill or release; the type and quantity of substance or material involved; and an explanation of his judgment not to respond to the episode. This record will be maintained in the EPRB. Copies of all phone calls involving hazardous waste generators, transporters and treatment, storage or disposal facilities, should be hand carried to the Waste Management Section, Air and Hazardous Materials Division, to determine compliance with the Resource Conservation and Recovery Act (RCRA), Subtitle C regulations or equivalent state regulations.

(2) If the information provided by the caller in the report of a spill or release is insufficient, or the duty officer's information concerning the potential hazard of a substance or material is inadequate to dictate immediate EPA response, he will promptly consult with appropriate designated program representatives to determine whether such response is indicated. If a decision not to respond is made, the duty officer will so notify the caller, following the procedure contained in paragraph (1) above. If a decision to respond is made, the duty officer will follow the procedure contained in paragraph (3) below.

(3) If EPA emergency response to a spill or release is clearly indicated based on information furnished, the duty officer will immediately notify designated principal or alternate representatives from appropriate program areas, as needed, that they have become a part of the EPRB as a member of the emergency response team for the incident.

The circumstances of the emergency, including the substance, media, and support necessary will dictate which program area representative(s) will be activated. The duty officer will notify EPRB Chief (or Acting Chief), who will assign an OSC for the emergency response team. At the conclusion of the emergency, program area representatives will be deactivated by the OSC or by joint agreement between the EPRB Chief and the program supervisor. Deactivation disagreements will be resolved by the appropriate Division Directors or (as a last resort) by the Regional Administrator.

e. Response Activities. The OSC will carry out the responsibilities stated in Chapter 3, Part I of the Regional OHSPCP. Response activities will follow the 5 operational phases described in the Regional OSHPCP -- as follows:

Phase I - Discovery and Notification
Phase II - Evaluation and Initiation of Action
Phase III - Containment and Countermeasures
Phase IV - Cleanup, Mitigation, and Disposal
Phase V - Documentation and Cost Recovery

In addition, the OSC will notify the appropriate state agency. In the event water supplies may be threatened, the OSC will request the appropriate state agency to notify downstream water users. If the state cannot respond to this request, EPA will assume this responsibility.

f. Emergency Funding. The OSC is authorized to verbally obligate funds not exceeding $400 for immediate mitigatory actions during any emergency situation, providing:

(1) The expenditure of funds is under the direct control of an on-scene federal or state official;

(2) The spiller or cause of the episode will not or cannot take appropriate action;

(3) Manpower and/or equipment are immediately available; and

(4) Immediate action will minimize or preclude significant environmental damage.

5. RESPONSIBILITIES. It is not practical to staff the EPRB with personnel having the wide range of technical expertise necessary to respond to the myriad varieties of emergency episodes. To do so would simply duplicate the capabilities contained in other program areas of the Region Office. This Plan utilizes the capabilities of various program officers to provide full EPA response to environmental emergencies. The responsibilities of various program offices are described below.

a. Emergency Planning and Response Branch.

(1) Through a duty officer, provide 24-hour monitoring of the emergency telephone number (303-837-3880) to accept all reports of oil spills and releases of toxic chemicals or hazardous materials and activate response.

(2) Designate an OSC to assemble the emergency response team (including program area representatives as needed) and carry out the responsibilities stated in paragraph 4.

(3) Monitor the progress of each phase of response.

(4) Assure that the Regional Administrator is apprised of all major environmental episodes and significant events during response action.

(5) Activate the Regional Response Team in accordance with provisions of the Regional OHSPCP when appropriate or when required.

(6) Obtain participation of appropriate state and/or local officials.

(7) Inform Office of Public Awareness and Intergovernmental Relations of significant oil and hazardous substances spills or other environmental emergencies.

(8) Notify the Waste Management Branch representative of an emergency occurring during the loading, transporting, or unloading of a hazardous waste.

(9) Notify the Waste Management Branch radiation representative of any emergency event involving radioactive materials.

(10) Notify the Control Technology Branch of emergencies affecting public water supply systems.

(11) Notify the Toxics Substances Branch of any significant emergency event involving toxic substances or pesticides.

b. Office of Public Awareness and Intergovernmental Relations (OPAIR).

(1) Depending on the severity and circumstances of the emergency, the OPAIR Director will decide their response to the emergency.

(a) For spills or emergencies considered consequential to the Region, an OPAIR representative will accompany the OSC to the emergency scene and serve as the OSC's liaison to the news media.

(b) For less significant emergencies, after consultation with the OSC, OPAIR may wish to contact news media in the emergency vicinity and provide them with information about the events.

(2) Issue, when appropriate and after consultation with the On-scene Coordinator, news releases to inform the public of an existing problem, actions by EPA, cleanup progress, or other significant occurrences.

(3) Arrange for radio or television interviews or appearances, when appropriate, of EPA representatives involved in emergency response activities.

(4) Notify Congressional home offices of significant environmental emergencies.

c. Office of Regional Counsel.

Provide legal interpretations of the emergency or imminent hazard sections of EPA statutory authorities to determine EPA's responsibilities and limits (if any) thereon.

d. Technical Investigations Branch, Surveillance and Analysis Division.

(1) Provide personnel for investigation of fish kill episodes and assist in damage assessment surveys.

(2) Recommend the number, type, and size of samples required to assess the nature and magnitude of an emergency episode.

(3) Perform laboratory analyses on samples collected.

e. Surveillance Branch, Surveillance and Analysis Division.

(1) Provide on-site monitoring of gaseous releases that may result in hazardous air quality conditions.

(2) Provide advice on the need to evacuate areas subjected to hazardous air quality conditions.

f. Control Technology Branch, Water Division.

(1) Alert the appropriate state water supply program(s) and, if necessary, immediately affected water suppliers, of the incident and its potential for water supply contamination.

(2) Insure that proper tests are conducted on drinking water supplies that may be affected by spills to assure protection of public health.

(3) Determine appropriate treatment techniques or procedures that may be used to remove the contaminant from drinking water (surface or subsurface).

(4) Provide advice on resolution of ground water contamination problems.

g. Enforcement and Legal Support Branch, Enforcement Division.

(1) Initiate all enforcement actions that are appropriate resulting from environmental episodes. Prepare all legal documents relating to enforcement actions, and work with the U.S. Attorney's Office to represent EPA in such actions.

(2) Assist the On-scene Coordinator in matters of "right-of entry," search warrants or any other situation which may pose legal questions on scene or during the emergency.

h. Toxic Substances Branch, Air and Hazardous Materials Division.

(1) Provide toxicological data and information concerning spilled pesticides and toxic chemicals involved in an incident.

(2) Describe the chemical properties, and provide information on personal safety, protective clothing, decontamination, and disposal of spilled pesticides or toxic chemicals.

(3) Maintain a list of Poison Control Centers from which emergency information may be obtained.

(4) If the incident involves a pesticide or a TSCA regulated chemical, conduct the appropriate investigation for possible violations under FIFRA, as amended, or TSCA.

i. Waste Management Branch, Air and Hazardous Materials Division.

(1) Provide information and expertise necessary to effect environmentally safe storage, treatment or disposal of such materials or waste as specified under regulations set forth in Subpart A, 250.10 Criteria, Identification and Listing of Hazardous Wastes in Subpart C of the Resource Conservation and Recovery Act (RCRA).

(2) In coordination with appropriate state and local agencies, determine disposal sites for spilled oil or hazardous materials.

(3) Provide technical expertise, field radiation measurements and assistance during EPA response to radiation emergencies.

(4) Notify EPA Headquarters of the existence of a radiation emergency.

j. Air Branch, Air and Hazardous Materials Division.

(1) Provide meteorological information, as needed, during any environmental emergency.

(2) Based on meteorological information, provide recommendations on the area extent of evacuation zones during emergencies causing hazardous air quality conditions.

F. Administrative Services Branch, Management Division

(1) Provide logistics (vehicles, space, etc.) and supply support during environmental emergencies.

(2) Provide purchasing and contracting support.

1. Montana Office.

For emergency events in Montana, this office will have the same responsibilities of the various program areas. If this office cannot perform any particular responsibility, the responsibility will revert to the appropriate program area.

Alan Merson
Regional Administrator

ATTACHMENT I

EMERGENCY RESPONSE TEAM
PROGRAM AREA REPRESENTATIVES

OFFICE	PRINCIPAL	ALTERNATE
Emergency Planning & Response Branch	Alvin Yorke	Richard Jones
Office of Public Awareness and Intergovernmental Relations	Richard Lathrop	Jo Harrison
Surveillance and Analysis Division		
Technical Investigations Branch		
Field	Cornelio Runas	Loys Parrish
Laboratory	John Tilstra	Bob Tauer
Surveillance Branch	Keith Tipton	Bill Basbagill
Water Division		
Control Technology Branch	Jack Hoffbuhr	Dean Chausse
Enforcement Division		
Enforcement and Legal Support Branch	John Lepley	Steve Jones Greg Halburt Al Smith
Air and Hazardous Materials Division		
Toxic Substances Branch		
Information	Ralph Larsen	Dallas Miller
Investigations	Dan Bench	Henry Bonzek
Waste Management Branch		
Hazardous Wastes	Henry Schroeder	Jon Yeagley
Radiation	Paul Smith	John Giedt
Air Branch	Donald Henderson	
Management Division		
Administrative Services Branch	Ellis Linn	Alfred Broach
Office of Regional Counsel	Joseph Muskrat	Kemper Will
Montana Office	Dick Montgomery	Bob Fox