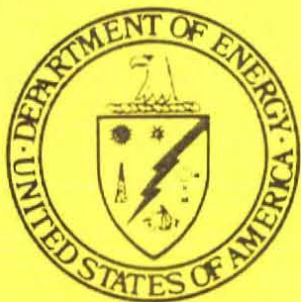


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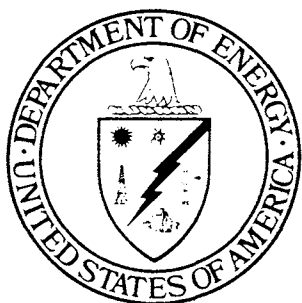
**Bonneville Power
Administration**

Proposed Fiscal Year 1981 Program

U.S. DEPARTMENT OF ENERGY

October 1980

Final Environmental Impact Statement



**Bonneville Power
Administration**

Proposed Fiscal Year 1981 Program

U.S. DEPARTMENT OF ENERGY

Washington, D.C., 20545

October 1980

Responsible Official

Ruth C. Clusen

Assistant Secretary for Environment

COVER SHEET

Responsible Agency: Department of Energy, Bonneville Power Administration.

Title of Proposed Action: Fiscal Year 1981 Construction and Maintenance Program Final Environmental Impact Statement.

States and Counties Involved: Idaho-Bingham, Bonner, Bonneville, Boundary, Cassia, Clearwater, Elmore, Gem, Kootenai, Latah, Minidoka, Nez Perce, Shoshone, Teton; Montana-Deer Lodge, Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Powell, Sanders, Silver Bow; Oregon-Benton, Clackamas, Columbia, Coos, Curry, Deschutes, Douglas, Gilliam, Harney, Hood River, Jefferson, Klamath, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Sherman, Tillamook, Umatilla, Union, Wasco, Washington, Wheeler, Yamhill; Washington-Adams, Benton, Chelan, Clallam, Clark, Columbia, Cowlitz, Douglas, Franklin, Garfield, Grant, Gray's Harbor, Jefferson, King, Kitsap, Kittitas, Klickitat, Lewis, Lincoln, Mason, Okanogan, Pacific, Pend Oreille, Pierce, San Juan, Skagit, Skamania, Snohomish, Spokane, Stevens, Thurston, Wahkiakum, Whatcom, Whitman, Yakima; Wyoming-Lincoln.

Abstract: The Fiscal Year 1981 Proposed Program would result in the removal of approximately 1,163-1,644 acres (465-658 ha) of forest land from timber production; the permanent removal of all vegetative cover from approximately 246-259 acres (98-104 ha) as a result of the construction of the new substations, transmission lines, and permanent access roads; removal of approximately 22-25 acres (9-10 ha) of cropland from production; vegetation control measures which will reduce vegetative cover on approximately 18,646 acres (7,544 ha) of existing right-of-way and 780 acres (316 ha) of existing substation property by the use of herbicides and manual cutting; effects both beneficial and adverse on existing wildlife habitat which would occur as a result of construction and maintenance activities as indicated above; impacts to fisheries and aquatic organisms as represented by the waterways or tributary streams that would be crossed during construction; visual impacts to scenic resources; introduction of combustion byproducts into the atmosphere as a result of open burning of slash from clearing forest land; soil erosion from the clearing, construction, and maintenance activities involved in the proposed program; audible noise during operation of construction equipment and transmission lines and substations; risk of man-caused accidents; and maintenance of a high standard of living and level of productivity for the Pacific Northwest through continued availability of reliable electric service.

No decision on the proposed action shall be made until

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SUMMARY

MAJOR CONCLUSIONS

Purpose of and Need for Action. To carry out its power marketing functions as mandated by Congress, the Bonneville Power Administration (BPA) has designed and constructed a network of high-voltage transmission facilities which serves as the main power grid for the Pacific Northwest. Over this grid, BPA wholesales electrical power to 147 customers in the States of Oregon, Idaho, Washington, and parts of Montana, Wyoming, Utah, and California. BPA also transmits surplus electrical power to 13 customers in Canada and California. To continue performing these functions, BPA must provide service to new loads and also maintain the reliability of its transmission system. Power flow studies based on load forecasts have identified deficiencies in the transmission system, becoming manifest as peak load flow increases. Without corrective action electric service reliability would then be jeopardized. To ensure reliable continued service by avoiding outages and damage to equipment in the system, BPA must take preventive maintenance actions. Rights-of-way in forested areas require regular vegetation management to prevent tall-growing vegetation from growing into transmission line conductors. A total of 83,371 acres in the BPA system require regular vegetation management. Substation yards must be kept free of all vegetation because it presents hazards to the continued operation of substation electrical equipment. Also, emergency maintenance may be required to repair damage from natural calamities or vandalism. In satisfying these underlying needs, BPA also aims to achieve a number of goals or purposes based on contractual obligations, energy conservation, technical and economic efficiency, and the preservation and enhancement of environmental quality.

Alternatives. For FY 1981, BPA proposes to proceed with a program to construct system additions and modifications including 303-326 miles of new 500 kV transmission lines, approximately 131 miles of upgraded existing lines, 6 new substations, and facility additions at 7-8 existing substations. These system additions and modifications would serve new loads and reinforce the transmission system to maintain its reliability. Alternatives eliminated from detailed study are nonconstruction (no action), conservation, direct current transmission, underground conductoring, and load-center generation. A program of nonconstruction would result in system overloads and a greater likelihood of repeated power failures. Ongoing and proposed conservation programs cannot be implemented with adequate scale and timeliness to sufficiently reduce projected needs and obviate the proposed construction. Direct current transmission is uneconomical at line lengths less than 400 miles. Underground conductoring is technically limited and is 7-8 times more costly than equivalent overhead transmission lines. Load-center generation includes combustion turbines which have technical limitations, and cogeneration and biomass which have technical limitations and are still under feasibility analysis. Delay is the only possible alternative to the proposed program that could reasonably satisfy the underlying need.

To avoid outages and damage to equipment, and thereby ensure reliable continued service, BPA proposes a program to control unwanted vegetation by multiple techniques and maintain electrical equipment and other facilities. In managing the vegetation on its transmission line rights-of-way, access roads, substations, and other facilities, BPA proposes to combine hand and mechanical cutting with herbicide use to maximize efficiency and minimize environmental impact. Where the greatest selectivity is desired, BPA would utilize hand and mechanical cutting and application of herbicides to stumps; where selectivity is desirable and herbicide use would present little hazard, BPA would selectively apply herbicides from the ground; where selectivity is not a factor, access is difficult, and herbicide use would present little hazard, BPA would apply herbicides aerially. For FY 1981, tentative planning indicates that approximately 13,321 acres would receive treatment by selective ground application of herbicides, approximately 3,680 acres by aerial application, approximately 1,735 acres by hand and mechanical cutting, and 64,725 acres deferred for treatment in following years. The herbicides that BPA would use most are 2,4-D, picloram, and dicamba. All herbicides proposed for use are approved by the Environmental Protection Agency (EPA) and would be used in accordance with label instructions. Application rates greater than those specified on the product label would never be used. If a landowner objects to BPA vegetation management methods, BPA would allow the owner to assume responsibility for the vegetation on the easement. BPA would also encourage the multiple use of its rights-of-way by landowners if the use does not conflict with operating and maintaining the transmission system. Alternatives to the proposed multiple vegetation control techniques are no action, exclusive use of hand and mechanical cutting, and exclusive reliance on herbicide use. No action is not generally reasonable because it would jeopardize the continuity of electrical service. The exclusive use of hand and mechanical methods is generally not feasible because stumps and stems would quickly resprout, demanding the frequent attention of maintenance crews. This would cause the greatest impact to soil and water resources and the greatest incidence of personal injury. Exclusive use of herbicides to control unwanted vegetation would maximize the introduction of herbicides into the environment and the potential for hazardous exposures. The proposed vegetation management plan is the environmentally preferable alternative because it would allow the flexibility to minimize the potential for hazardous exposures to herbicides and also minimize the use of access roads.

Environmental Consequences. New and upgraded transmission lines included in the proposed program would cross land uses as summarized in Table 1. The environmental effects that would result from implementing the FY 1981 proposed construction and maintenance program are summarized below:

- permanent removal of all vegetative cover from approximately 246-259 acres (98-104 ha) as a result of the construction of the new substations, transmission lines, and permanent access roads.
- introduction of combustion byproducts into the atmosphere as a result of open burning of slash from the clearing of forest land.

TABLE 1

Land Uses Crossed By Proposed
New and Upgraded Transmission Lines

	Total	115-kV	161-kV	230/115-kV double circ.	500-kV
Agriculture	112-130 mi (179-208 km)	23 mi 37 km	47 mi (75 km)	3 mi (5 km)	39-57 mi (62-91 km)
Forest	97-120 mi (155-192 km)	20 mi (32 km)		20 mi (32 km)	57-80 mi (91-128 km)
Range/Pasture	196 mi (314 km)	4 mi (6 km)			192 mi (307 km)
Urban/Residential	5-14 mi (8-22 km)	1 mi (1.6 km)			4-13 mi (6-21 km)
Mixed	14-22 mi (22-35 km)			13 mi (21 km)	1-9 mi (1.6-14 km)
Totals	424-482 mi (678-771 km)	48 mi (77 km)	47 mi (75 km)	36 mi (58 km)	293-351 mi (469-562 km)

- removal of up to 1,163-1,644 acres (465-658 ha) of forest land from timber production, costing 6-7 annual jobs in the forest industry and 12-14 service jobs.
- removal of up to 22-25 acres (9-10 ha) of cropland from production, to be occupied by tower footings and substations.
- alteration of existing wildlife habitat which could result in locally decreased wildlife populations.
- temporary impacts to fisheries and aquatic organisms in the waterways or tributary streams that would be crossed during construction.
- permanent visual impacts to scenic resources.
- temporarily accelerated soil erosion attributable to the clearing, construction, and maintenance activities involved in the proposed program.
- local residents would likely be annoyed by noise, induced electrical currents, and trespassing.
- potential hazards to bird flights.
- slight local degradation of water quality, especially at stream crossings, with potential adverse impacts to fisheries.
- control of tall-growing vegetation on rights-of-way.
- reduction of vegetative cover on approximately 18,646 acres (7,544 ha) of existing right-of-way and 780 acres (316 ha) of existing substation property.
- introduction of herbicides into the Pacific Northwest environment as a result of vegetation control by aerial and ground application.

AREAS OF CONTROVERSY

Conservation. Comments received from the Oregon Environmental Council and the Flathead National Forest expressed a belief that BPA could do more to promote energy conservation in the region. These agencies apparently based their belief on the Draft EIS discussion of conservation as an alternative to the proposed program for construction of new and modification of existing transmission facilities. The underlying need for the proposed construction program is expected future deficiencies identified by power flow studies based on load forecasts. These forecasts have included anticipated conservation as a factor in their formulation. These points have been clarified in the Final EIS. Conservation alone is not a reasonable alternative to the proposed program for construction because new conservation programs could not reduce the projected load in time to eliminate the need for new and upgraded facilities.

Air quality. The Public Health Service and the Flathead National Forest objected to BPA's disposal of slash by open burning. The Public Health Service believes that "special harvest equipment" could dispose of slash mechanically without excessive road development and that slash could be windrowed in the rights-of-way. At times, BPA has used chipping machinery to dispose of slash, and has found it considerably more costly. We are uncertain what is meant by "special harvest equipment." The Flathead National Forest believes that slash burning is, "a waste of BTU's" and that slash could be utilized. BPA is studying the use of wood residue for electrical generation, but the amount of slash created by transmission line right-of-way clearing is minor compared to that available from commercial logging in the region. Therefore, slash from logging is expected to be the primary source of fuel at a wood-fired electrical generation plant. Where air pollution regulations permit, open burning is BPA's preferred method of slash disposal, with piles constructed to reduce smoke to the minimum amount possible.

Local permits. The Washington State Department of Ecology, the Cowlitz County Department of Community Development, and the Regional Planning Council of Clark County claim that BPA projects may require local permits under the State of Washington's Shoreline Management Act. As an agency of the Federal Government, BPA is not obliged to obtain siting permits from State or local governments. The supremacy clause of the United States Constitution prevents State and local control over the operations of the Federal Government unless supremacy has been clearly waived by Congress. Control includes the issuance of permits, and BPA will not seek a permit under the State's Shoreline Management Act. However, BPA will (1) provide information to and consult with State and local governments on specific proposed projects and (2) assure maximum feasible consistency of specific proposed projects with State and local plans and programs.

Use of herbicides. Various groups and individuals have claimed that the use of herbicides presents an unacceptable hazard to human health. The vast majority of scientific investigations to date do not support these claims. The group Friends of the Earth disputes BPA findings on the toxicity of the herbicides 2,4-D and picloram. Friends of the Earth believes that these chemicals, "produce very serious health effects at doses used." However, most laboratory tests have shown that large and prolonged doses are generally required to cause significant biological effects in humans. Friends of the Earth also claims that it is impossible to aerially apply herbicides without affecting nontarget areas. By experience with aerial application, BPA is usually able to avoid impingement on nontarget areas by adding drift control agents to the herbicide mix, using ground observers during application, restricting aerial application in winds over 6 mph, restricting release height to 160 feet above ground, and leaving buffer zones along the edge of the right-of-way. Around bodies of water, the proposed vegetation management plan would leave buffer zones of 100 feet during aerial application and 10 feet during ground application (except for treatment of stumps with herbicides approved by EPA for use to water's edge). The Oregon Department of Lands recommends hand removal of vegetation, particularly within 200 feet of water bodies. Through herbicide residue monitoring BPA has found its proposed buffer zones to be adequate.

ISSUES TO BE RESOLVED

Because there is no reasonable alternative to construction, BPA must decide whether to proceed with the proposed construction program for FY 1981 or to delay. Delay offers no general environmental advantage and would likely have economic disadvantage because of inflation.

The major issue to be resolved for the maintenance and right-of-way management component of the FY 1981 program is which general approach to adopt for controlling unwanted vegetation on the BPA transmission system. Generally, the most efficient method of controlling vegetation is the use of herbicides. However, this presents a potential for hazardous exposure to toxic chemicals. Manual cutting is another vegetation control method. Exclusive reliance on manual cutting would not introduce herbicides into the environment but is very inefficient and would present adverse impacts from the excessive use of access roads.

To preserve and enhance environmental quality, BPA must determine which means or combination thereof to adopt for avoiding or minimizing potential environmental harm resulting from the selected alternatives. These means may include parallel construction, facility upgrading, erosion control, revegetation, buffer zones, and herbicide residue monitoring.



TABLE OF CONTENTS

	<u>Page</u>
I. <u>PURPOSE OF AND NEED FOR ACTION</u>	I-1
A. CONSTRUCTION	I-1
1. Needs	I-1
2. Purposes	I-2
B. MAINTENANCE AND RIGHT-OF-WAY MANAGEMENT	I-3
1. Needs	I-3
2. Purposes	I-4
II. <u>ALTERNATIVES, INCLUDING THE PROPOSED ACTION</u>	II-1
A. CONSTRUCTION	II-1
1. Proposed Construction of System Additions and Modifications	II-1
2. Delay	II-6
3. Nonconstruction	II-7
4. Conservation	II-7
5. Direct Current (d-c) Transmission	II-9
6. Underground Conducing	II-10
7. Load-Center Generation	II-11
a. Combustion turbines	II-11
b. Biomass/Cogeneration	II-12
B. MAINTENANCE AND RIGHT-OF-WAY MANAGEMENT	II-13
1. No Action	II-13
2. Maintenance of Electrical Equipment and Other Facilities	II-13
3. Hand and Mechanical Cutting	II-13
4. Herbicide Use	II-14
5. Multiple Vegetation Control Techniques	II-17
III. <u>AFFECTED ENVIRONMENT</u>	III-1
A. PHYSICAL ENVIRONMENT	III-1
B. LAND USE AND OWNERSHIP	III-2
C. THE REGIONAL ECONOMY	III-2
D. PATTERNS OF ELECTRICITY USE	III-3
E. EXISTING FACILITIES FOR THE GENERATION AND BULK TRANSMISSION OF ELECTRICITY	III-4
F. SERVICE AREAS	III-4

	<u>Page</u>
IV. <u>ENVIRONMENTAL CONSEQUENCES</u>	VI-1
A. CONSTRUCTION	VI-1
1. Impact on Socioeconomic Resources and Land Use	VI-1
a. Urban and residential	VI-4
b. Agriculture	VI-5
c. Grazing	VI-6
d. Silviculture	VI-7
e. Recreation	VI-8
f. Scenery	VI-9
g. Historic, archaeologic, natural landmarks	VI-9
h. Risk of accidents and health effects	VI-11
(1) Electrical hazards	VI-11
(2) Electrostatic and electromagnetic field effects	VI-12
2. Impact on Natural Resources	VI-13
a. Atmosphere	VI-13
(1) Air quality	VI-13
(2) Noise	VI-15
b. Biosphere	VI-15
(1) Vegetation	VI-16
(2) Fish and wildlife	VI-16
(a) Fish resources	VI-16
(b) General wildlife resources	VI-18
(c) Birds	VI-19
c. Hydrosphere	VI-20
(1) Water quality and quantity.....	VI-20
(2) Specially protected aquatic resources	VI-21
(a) Floodplains	VI-21
(b) Wetlands	VI-22
(c) Wild and scenic rivers	VI-22
(d) Navigable waters	VI-23
(e) Waters of the United States	VI-24
d. Lithosphere	VI-24
(1) Soils	VI-25
(2) Mineral resources	VI-25

	<u>Page</u>
B. MAINTENANCE AND VEGETATION MANAGEMENT	VI-25
1. Impacts of Maintaining Electrical Equipment and Facilities	VI-25
2. Impacts of Vegetation Management	VI-26
a. Hand and mechanical cutting for vegetation control	VI-27
b. The use of herbicides for right-of-way vegetation management	VI-27
(1) General toxicological considerations	VI-28
(a) General toxicity	VI-28
(b) Teratogenicity	VI-30
(c) Mutagenicity	VI-30
(d) Oncogenicity	VI-31
(e) Carcinogenicity	VI-31
(2) General fate and persistence of applied herbicides	VI-32
(a) Drift	VI-33
(b) Volatility	VI-34
(c) Adsorption	VI-36
(d) Leaching	VI-36
(e) Microbial breakdown	VI-37
(f) Chemical breakdown in soil	VI-37
(g) Chemical breakdown in plants	VI-38
(h) Photodegradation or decomposition ..	VI-38
(3) Analysis of herbicides proposed for use .	VI-38
(a) 2,4-D	VI-38
(b) Dicamba	VI-49
(c) Picloram	VI-57
(d) Herbicides used at substations and minor right-of-way use herbicides...	VI-66
C. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS SHOULD THE PROPOSAL BE IMPLEMENTED	VI-71
D. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY	VI-72
E. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES	VI-73
V. <u>LIST OF PREPARERS</u>	V-1
VI. <u>LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT</u>	VI-1
VII. <u>SUBJECT INDEX</u>	VII-1

	<u>Page</u>
VIII. <u>REFERENCES</u>	VIII-1
IX. <u>COMMENTS RECEIVED ON THE DRAFT EIS</u>	IX-1
X. <u>RESPONSE TO COMMENTS</u>	X-1
XI. <u>SUMMARIES OF PUBLIC MEETINGS</u>	XI-1

Appendix 1: Supplementary 2,4-D Laboratory Toxicity Data

LIST OF FIGURES

Figure 1	BPA Main Grid Additions 1980-1999	I-2
Figure 2	BPA System Map	I-4
Figure 3	Transmission and Substation Location Map - BPA Proposed FY 1981 Program.....	II-4
Figure 4	Subregions and Major Cities	III-2
Figure 5	Major Hydroelectric Dams and Thermal Plants	III-4
Figure 6	Typical Dose Response Curve	IV-30
Figure 7	Concentration of Dicamba in Farmer Creek After Aerial Application of 1.12 kg Dicamba per ha. of a 244-ha. Watershed	IV-51
Figure 8	Disappearance of Picloram from Blood of Steer After Withdrawal from Diet	IV-65

LIST OF TABLES

		<u>Page</u>
Table 1	Land Uses Crossed by Proposed New and Upgraded Transmission Lines	iv
Table 2	Transmission Lines Miles by Voltage	II-2
Table 3	FY 1981 Major New Facility Proposals	II-4
Table 4	Herbicides and Drift Control Additives Used by BPA	II-14
Table 5	FY 1981 Proposed Program for Vegetation Management	II-19
Table 6	Effect of Various Factors on Herbicide Drift	IV-35
Table 7	Survival of Yearling Coho Salmon Exposed to Dicamba in Freshwater and Subsequent Survival Following Transfer to Seawater	IV-55

PURPOSE OF AND NEED FOR ACTION

I. PURPOSE OF AND NEED FOR ACTION

The Bonneville Power Administration was established by Congress in 1937 to act as the Federal wholesale marketing agency for electrical energy generated at Bonneville Dam. Since that time, it has been designated as the marketing agency for electrical power generated at 29 other Federal hydroelectric facilities in the Pacific Northwest. Together with BPA's transmission facilities, these Federal hydroelectric facilities, constructed and operated by the Corps of Engineers and the Water and Power Resources Service, comprise the Federal Columbia River Power System.

To carry out its marketing functions BPA has designed and constructed a network of high-voltage transmission facilities which serves as the main power grid for the Pacific Northwest, providing approximately 70 percent of the region's bulk power transmission capacity. Over this grid, BPA wholesales electrical power to 147 Pacific Northwest customers including 15 industries in the States of Oregon, Idaho, Washington, parts of Montana and Wyoming west of the Continental Divide, and small parts of northern Utah and California. BPA also transmits surplus electrical power to 13 customers in Canada and California.

A. CONSTRUCTION

1. Needs

To continue performing its marketing functions, BPA must provide service to new loads and also maintain the reliability of its transmission system. Power flow studies based on load forecasts have identified expected future deficiencies in the BPA transmission system. These deficiencies can be corrected by new transmission facilities, modification of existing facilities, load-center generation, or through conservation and other load reduction programs. Projected major transmission grid requirements through the year 1999 are shown in Figure 1.

The Pacific Northwest Utilities Conference Committee (PNUCC) annually prepares a load forecast for the region. In their publication Long-Range Projection of Power Loads and Resources for Resource Planning, 1980, the PNUCC estimates an average annual load growth rate of 3.1 percent over the next 20 years. This is based on an econometric model utilizing population forecasts, employment, increased conservation efforts, prices of energy, and many other economic input variables. Load estimates reflect the best knowledge available at the time they are prepared. Unanticipated changes in economic and other factors may cause actual loads to be greater or less than previously estimated. Depending on the magnitude of unanticipated changes, they may directly affect the system needs presently identified.

Based on this and other forecasts, power flow studies utilizing computer models have identified weaknesses in the transmission system, becoming manifest as peakload flow increases. Without corrective action electric service reliability would then be jeopardized.

The standards for performance of the transmission system are defined in BPA's reliability criteria establishing that:

- With one major line to a load area out of service, a fault followed by an unsuccessful reclosure on a major line to another load area or a fault followed by a successful reclosure on another line to the same load area shall not cause regional disruption or load area separation. Therefore, a major load area is usually served by multiple lines or direct connections with the main grid transmission network.
- A bus fault cleared by backup relaying shall not cause regional disruption, but may result in the separation of one load area from the rest of the grid.
- Simultaneous faults on one major line (main grid, high capacity) and one intermediate line (lower capacity, less critical) which are either in the same right-of-way or terminate in the same substation shall not cause regional disruption or area separation if either circuit is successfully reclosed.
- The loss of all lines through one pass or one right-of-way shall not cause regional disruption. The area served by these will probably be separated and load and local generation must be brought into balance by load shedding. In some cases, the loss of inter-regional ties may result.
- During abnormally cold weather, an unsuccessful reclosure of a major line to any one load area shall not cause regional disruption or area separation.

The system is normally subjected to maximum stress during periods of maximum load. The peakload period in the Northwest occurs during the winter season. During the summer, the loads decline to about 60 percent of the winter peak except for certain areas with large irrigation loads. The net result is that the system designed to meet the minimum reliability criteria during the winter peak load period normally receives less stress during the remainder of the year. This is partially offset by the need to remove selected lines from service during the summer to perform maintenance and construction. It is also offset by the transmission to areas outside the region of surplus hydrogeneration when available.

2. Purposes

In satisfying these underlying needs, BPA also aims to achieve a number of goals or purposes:

- To fulfill contractual obligations with its customers;



FIGURE 1



- To conserve energy and other resources;
- To pursue technical and economic efficiency;
- To pursue technical compatibility with connected utilities;
- To provide cost-effective service; and
- To preserve and enhance environmental quality.

Some of these goals or purposes often conflict with one another and may require tradeoffs among them.

B. MAINTENANCE AND RIGHT-OF-WAY MANAGEMENT

1. Needs

The BPA transmission system, shown in Figure 2, includes approximately 13,298 circuit miles (21,400 km) of transmission lines, 354 substations, associated access roads and maintenance buildings, and other support facilities. The underlying need in maintaining and managing this system is to ensure reliable continued service. Specifically, routine and preventive maintenance is needed to avoid outages and damage to equipment. Much of the line maintenance work necessary is determined by the results of aerial and ground inspections of the lines to identify damaged towers and conductors, damaged guy wires, damaged crossarms, pole rot, washed-out roads, hazardous vegetation, and encroachments.

Rights-of-way in forested areas require regular vegetation management, especially west of the Cascades where growth rates are high due to the large amount of precipitation. Tall-growing vegetation must be controlled to prevent it from growing into or near transmission line conductors. A total of 83,371 acres (33,348 ha) in the BPA system require regular vegetation management. Access roads not heavily used tend to grow in from the sides and become impassable or dangerous to travel. In agricultural, urban, residential areas, or rangeland, intensive vegetation management is usually not necessary. Substation yards must be kept free of all vegetation because it would present a fire hazard jeopardizing the continued operation of the electrical equipment within the substation.

Emergency maintenance may be required when conductors and structures are damaged by natural calamities such as fires, severe storms, lightning strikes, and snowslides; or when support structures or insulators are intentionally damaged by rifle fire or other forms of vandalism. The extent of necessary repairs depends on the nature of the damage; however, time is a critical factor so that full service can be restored to the affected area and system reliability maintained.

2. Purposes

In satisfying this underlying need, BPA also aims to achieve a number of goals or purposes:

- Public and worker safety;
- Multiple use of rights-of-way;
- Technical and economic efficiency; and
- Preservation and enhancement of environmental quality.

Some of these goals or purposes often conflict with one another and may require tradeoffs among them.

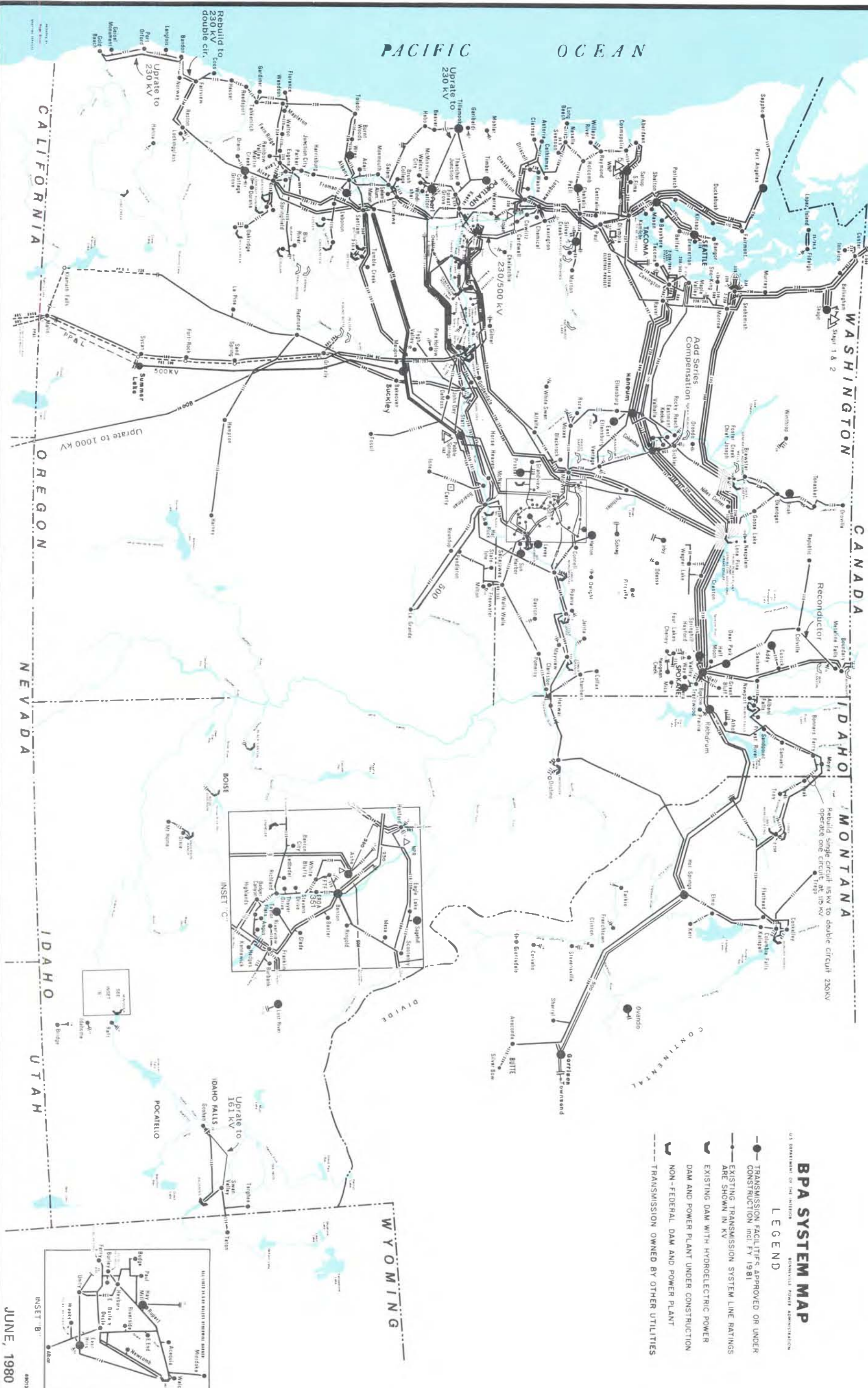


Figure 2

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ALTERNATIVES, INCLUDING THE PROPOSED ACTION

II. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

A. CONSTRUCTION

1. Proposed Construction of System Additions and Modifications

For FY 1981, BPA proposes to proceed with a program to construct approximately 434-447 miles (694-715 km) of transmission line. Of this total approximately 131 miles (210 km) would involve upgrading existing lines to higher capacity. Six new substations would also be built. In addition, facility additions would be made at 7-8 existing substations, one of which would require additional land. General locations for the new transmission lines and new substations are indicated in red on the location map (Figure 3). Major new facility proposals, for which site-specific environmental impact statements will be prepared, are shown in Table 3. Other FY 1981 proposals, for which environmental assessments may be prepared, are included in the figure totals in Table 2 and the text.

In addition to the new facilities proposed for the first time in the Fiscal Year 1981 Budget, work will continue on approximately 940 structural miles (1504 km) of transmission line and 13 substations included in prior fiscal year construction programs. In summary, the Fiscal Year 1981 proposed and ongoing construction programs will involve the transmission facilities shown in Table 2. Previously authorized proposals (shown as programmed in prior years in Table 2), although they may be currently under construction, were discussed in prior annual environmental statements.

Construction of transmission lines involves establishment of temporary construction access roads for movement of materials and heavy erection machinery to construction areas; clearing vegetation, structures, and other obstructions on the rights-of-way that might interfere with construction or operation of the line; burning or otherwise disposing of cleared vegetation; leveling areas necessary for tower sites and tower steel storage and staging areas; excavating for and installing tower footings; erecting transmission towers; stringing and tensioning conductor; construction of permanent maintenance access roads and associated stream crossings on and off the right-of-way as dictated by terrain and other factors; and reseeded or otherwise revegetating disturbed soil areas where appropriate.

Also included in the proposed program is construction of six new substations with associated power system control facilities. Work will continue in fiscal year 1981 on 13 substations authorized in prior years but not yet completed, for a total of 19 substations. Construction of substations and miscellaneous maintenance buildings involves establishing a permanent entrance road, clearing sites ranging in size from 1 to 15 acres (.4-6 ha), constructing a building or control maintenance complex (occupying 150 to 5,000 square feet or 14 to 465 square meters) and a fenced equipment yard, and installing electrical switchgear, line towers, and other support structures.

TABLE 2

TRANSMISSION LINE MILES BY VOLTAGE

(Figures are estimates based on assumptions of average or likely requirements. Totals shown in kilometers are slightly discrepant because of rounding-off.)

	<u>Total</u>	<u>115-kV</u>	<u>161-kV</u>	<u>230/115-kV double circuit</u>	<u>230-kV</u>	<u>500-kV</u>
New (N) and Upgraded (U) Facilities Proposed for FY 1981	434-447 mi. (694-715 km)	48 mi (U) (77 km)	47 mi (U) (75 km)	23 mi (U) (37 km)	13 mi (U) (21 km)	303-326 mi (N) (485-522 km)
Programmed in Prior Years (still under construction at end of FY 1980)	940 mi (1504 km)	30 mi* (48 km)			174 mi (278 km)	736 mi (1178 km)
Totals	1374-1397 mi (2198-2235 km)	78 mi (125 km)	47 mi (75 km)	23 mi (37 km)	187 mi (299 km)	1039-1062 mi (1662-1699 km)

*Includes 8.5 miles (13.7 km) of 35 kV and 0.1 mile (0.16 km) of 138-kV.

For details on construction activities, their sequence, and scope, see Chapter V of Appendix B of the Role EIS.

In developing a detailed plan of service for the new facilities, two key mitigation measures that will receive consideration are the paralleling of existing transmission lines and the upgrading of lower voltage lines to higher capacities.

The upgrading or replacement of existing low-voltage lines will be a primary consideration for the various facilities included in the Fiscal Year 1981 Proposed Program. The Fiscal Year 1981 Proposed Program involves the replacement of approximately 36-42 miles (58-67 km) of transmission line with new transmission line of higher capacity using essentially the same right-of-way. Also included in the Fiscal Year 1981 Proposed Program is the reconductoring of approximately 36-42 miles (58-67 km) of transmission line conductors with conductor cable of higher capacity and 47 miles (75 km) reinsulated to higher capacity. Impacts resulting from operations conducted during the upgrading of existing transmission lines are those associated with the movement of heavy equipment along existing rights-of-way, including the fording of streams and disturbances due to noise, dust, and increased human activity.

Preliminary planning indicates that approximately 189-209 miles (290-334 km) of new transmission line right-of-way required for the Fiscal Year 1981 new facilities could be located adjacent and parallel to existing transmission rights-of-way that would be required, depending upon the design of the line and the topographical conditions encountered.

Where new rights-of-way must be utilized, careful consideration will be given to compatibility of the new rights-of-way with current and potential future uses of the land. Special consideration will be given to the actual line location in order to avoid or minimize significant impact to important regional resources.

Specific mitigation measures to be employed during the construction operations of major Fiscal Year 1981 Proposals will be covered in site-specific environmental impact statements once a proposed route has been selected.

At this level of planning, the following potential impacts of the FY 1981 Proposed Construction Program have been identified. The potential for additional impacts will be evaluated in site-specific EIS's and EA's.

a. Temporary influxes of construction workers into local communities.

b. Adverse visual impacts. The publication entitled Environmental Criteria for Electric Transmission System jointly published by the Departments of Agriculture and Interior summarizes the measures normally used to lessen visual impacts of transmission. This publication is a guideline in the development of mitigation measures that are broadly applicable to transmission facilities in general.

TABLE 3

FISCAL YEAR 1981 MAJOR NEW FACILITIES PROPOSALS
(see map opposite page)

<u>Appendix Designation</u>	<u>Major Facility Proposals</u>	<u>Energization Date</u>
S.A. 81-1	Allston-Portland Transmission Reinforcement 500-kV Transmission Line 63-86 mi (101-138 km) new construction on 31-36 miles (50-58 km) new route and 27-55 miles (43-88 km) parallel route.	1986
S.A. 81-2	LaGrande-McNary 500-kV Transmission Line 84 miles (134 km) new construction on parallel route.	1985
S.A. 81-3	Buckley-Summer Lake 500-kV Transmission Line 156 miles (250 km) new construction on 86 miles (138 km) new route and 70 miles (112 km) parallel route.	1982

TRANSMISSION & SUBSTATION LOCATION MAP - BPA PROPOSED F.Y. 1981 PROGRAM

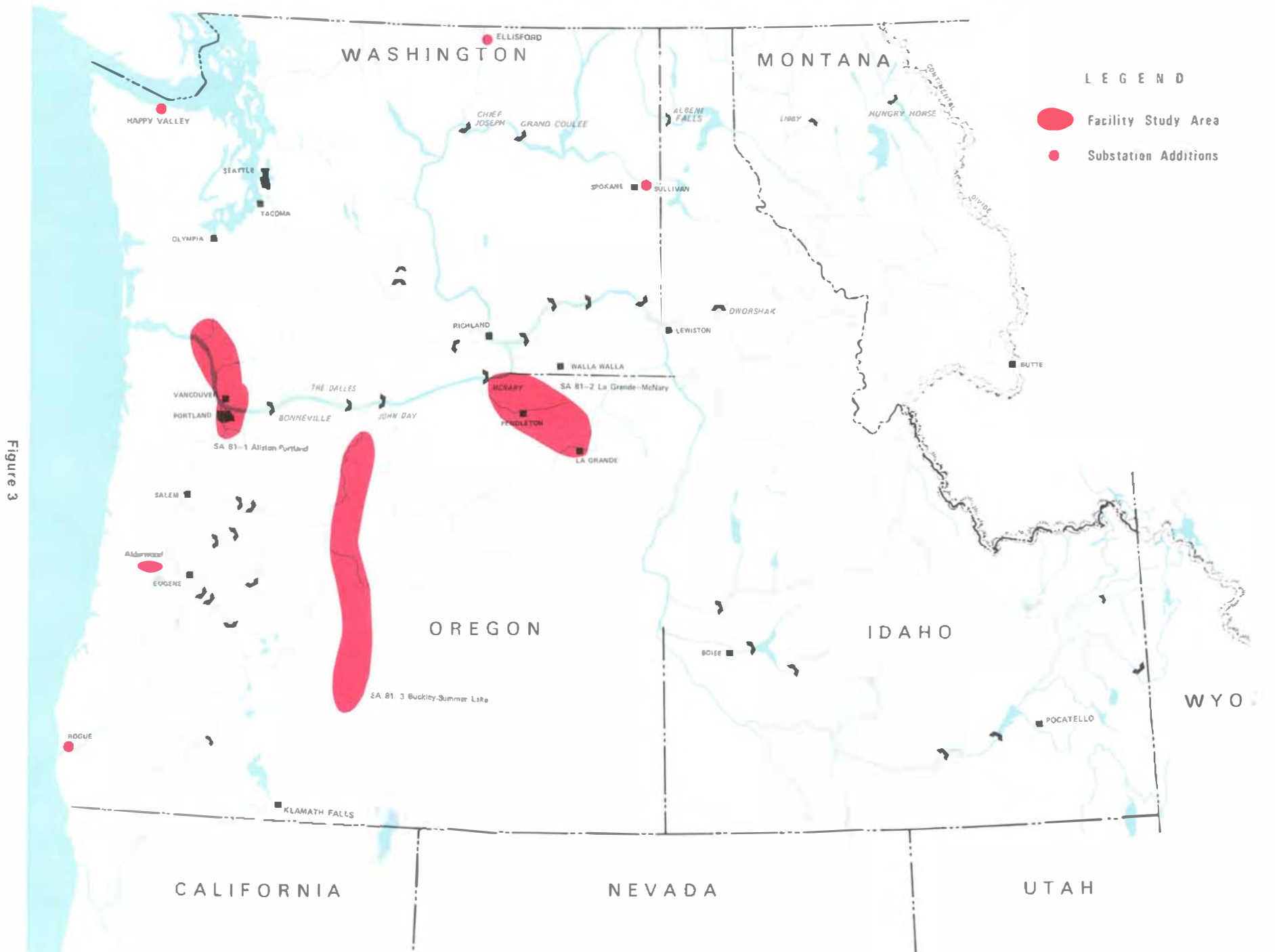


Figure 3



Examples of these measures include the use of vegetative screening, avoiding the location of transmission lines on ridges or with long views, occasionally deflecting rights-of-way, and strategically locating transmission line structures. Not all the criteria discussed in this publication would have applicability to the specific proposals contained in the Fiscal Year 1981 Proposed Program, but every consideration will be given to incorporate these measures into the ultimate design of the Fiscal Year 1981 proposals where feasible.

c. Conflicts with land uses, to varying degrees. Landowners will be compensated appropriately for easements and damages.

(1) Agricultural land occupied by tower footings and substations are permanently removed from production. A total of 22 to 25 acres (9 to 10 ha) may be removed from production. Towers may interfere with some systems of irrigation.

(2) The proposed construction of transmission lines may cross up to 192 miles (307 km) of rangeland and pasture with little permanent effect on the use of that land. An additional 19 to 21 acres (7.6 to 8.4 ha) may be removed from grazing use by three new substations.

(3) The proposed construction of transmission lines may cross 97 to 120 miles (155 to 192 km) of forest land, removing 1,112 to 1,572 acres (445 to 629 ha) from timber production. In addition, new permanent access roads would remove approximately 51-72 acres (20-29 ha). This would create short-term work for approximately 122 people, but cost 6-7 annual jobs in the forest industry and 12-14 service jobs for the life of the facilities.

(4) In urban and residential areas, local residents would likely be annoyed by noise, electrical field effects, and trespassing on 5 to 14 miles (8 to 22 km) of proposed new, parallel, or upgraded rights-of-way.

BPA would compensate landowners for easements across their land and any property damage that may occur as a result of BPA actions.

d. Adverse air quality impacts from the open burning of cleared vegetation. BPA would minimize impacts by proper construction of slash piles, compliance with State and local burning regulations, and chipping where appropriate. In some cases, slash is left in piles as cover for wildlife.

e. New noise sources would be created by the construction and subsequent operation of new transmission lines and substations. The noise would be limited because BPA will comply with appropriate State noise regulations.

f. Vegetation would be permanently removed from up to 246-259 acres (98-104 ha) of land for tower footings, substation sites, and permanent access roads. Additional acreages of vegetation would be temporarily damaged. Where practical BPA would revegetate with desirable grasses, herbs, and forbs.

g. The proposed construction would disturb and alter wildlife habitat by reducing available cover and increasing human access. BPA would consult with the U.S. Fish and Wildlife Service and time construction activities to minimize impacts. A beneficial effect could be an increase of available forage on new rights-of-way.

h. New transmission lines would create hazards to individual bird flights but not necessarily to bird populations. BPA would minimize conflicts with birds by locating new transmission routes away from areas of avian concentration.

i. Limited soil erosion and compaction would occur from construction activities. BPA would subsoil compacted farmlands, include erosion control techniques in the design of access roads, and revegetate where appropriate.

j. Slight local degradation of water quality, especially at stream crossings, with potential adverse impacts to fisheries, including valuable anadromous species. Timing construction activities to avoid peak spawning, retaining streamside vegetation, and installing culverts at more sensitive stream crossings will minimize the impacts to streams and fisheries.

2. Delay

The environmental impacts of the proposed new facilities would not vary significantly with time of construction, except that certain construction activities can and are proposed to be timed to occur during certain seasons to minimize impacts.

Delaying construction of the proposed new facilities would be of environmental benefit if technological improvements made it possible to reduce impacts, or if these improvements or changes in local or regional power demand would obviate the necessity of building the proposed facilities. No such changes are anticipated. Lead time necessary to incorporate new technological improvements preclude the possibility of utilizing any such development in time to meet projected loads and the scheduled energization dates for FY 1981 new start items.

The eventual cumulative environmental impact of delay can be expected to be the same as for the proposal as it now exists. However, delay would likely escalate construction costs because of inflation.

3. Nonconstruction

Cancellation of the Fiscal Year 1981 Program would most likely have only marginal, and probably adverse, impacts on the physical environment, since the chances are extremely high that the electric utilities in the Northwest would individually construct any transmission facilities that would be necessary to meet their utility obligations. BPA's proposals are the minimum necessary to meet forecasted growing transmission requirements, and are developed jointly with the electric utilities; consequently, any program undertaken by the utilities on an individual basis would be at least equal to and more probably would exceed the size, cost, and environmental impact associated with BPA's proposed plans.

If neither BPA or the Northwest utilities decide to provide new or additional service to an area, impacts to the physical environment resulting from the proposed construction would not occur; it would only be possible to speculate on the social impacts. However, it is most reasonable to believe that general economic development would continue and electrical demand would rise until, in certain periods of high peak demand, the system would be overloaded, resulting in a greater likelihood of repeated power failures. The lower reliability of electric service could present hardships or even physical hazards to many people in situations dependent upon electricity. Those businesses or industries that critically rely on continuous electrical service could be forced to relocate in an area where reliable service is available. This would mean some people will move out to follow that business employment. However, other businesses that do not rely critically on continuous electrical service would probably take its place, and the electricity demand would continue to push up against the maximum allowed by the existing system capacity. To maintain service reliability without increasing system capacity, increasing local populations could invoke voluntary rationing systems such as rotating outages, switch to alternate energy sources where available and applicable, and reduce per capita energy consumption levels.

Secondary impacts on the environment brought about by population concentration would probably be less than if abundant supplies of electricity were available. The additional secondary impacts that could have been imposed on this area had adequate electricity supplies been available would be shifted to other areas that would consequently become more populated.

Although projected loads (which the proposed new facilities are designed to serve) may decrease, they are not likely to decline at such a rate as to obviate new transmission facilities.

4. Conservation

To the extent energy conservation activities reduce peak demands (which determine transmission additions), energy conservation can potentially reduce the need for some new transmission facilities.

It is unlikely, however, that ongoing and proposed conservation activities in the Pacific Northwest will significantly affect the need for the proposed transmission additions because many of these activities are targeted primarily at reducing energy consumption (not peak demands), and because their greatest impacts will be felt only gradually after 1981.⁽¹⁾

The BPA conservation effort with the most probable significant impact on new transmission additions is one in which BPA evaluates investments in transmission system loss reduction technology by valuing losses at the marginal electricity costs. By investing economically in loss reduction technology, transmission facilities BPA builds or modifies are able to meet a higher peak demand with less new generation than if these investments had not been made. However, the FY 1981 Proposed Program already reflects this practice so no further reduction in facilities can be justified on this basis. Other BPA conservation programs to date have included an in-house information program and an infrared flyover public awareness program. Neither can be expected to significantly change peak (or energy) demands, or to alter the budget for new transmission facilities.

BPA is proposing some new conservation programs that may ultimately have some impact on peak demands. These are a residential insulation program, a solar water heat program, free irrigation pump testing service, and a demonstration end use windmill generator program. Each program would offer financial assistance to make these conservation technologies more economically attractive to speed their market penetrations. Nevertheless, because these programs are limited in scope (they are available only to a few public utilities), and because it is uncertain when each will be implemented, they would not contribute large peak energy savings in the near future. Furthermore, it is not clear what peak savings credit could be imputed to each; it is believed that both home weatherization and solar water heaters will reduce peak demand on a systemwide basis as well as save energy, but to what extent is uncertain. Finally, these programs are open-ended with respect to time so that results will be felt over a long period of time--only a small portion of the savings will occur in the near future. To conclude, these programs will cumulatively have a very small impact on the need for the proposed new transmission facilities.

Depending on the success of these pilot programs, regionwide implementation of similar programs may follow. Regionwide conservation programs would have a greater impact on peak demands for the obvious reason that more end-users would be served and also because systemwide diversification effects might be more significant. However, BPA does not yet have sufficient legal authority to fund many such programs without express congressional consent, nor does BPA feel prepared to carry out such programs until after observation of the small pilot programs. Nevertheless, regionwide implementation of these and other conservation programs is not a feasible alternative to constructing the proposed transmission facilities: even if BPA were to go ahead with regionwide programs now, it would be considerable length of time until

these programs could be implemented regionwide. Given a fairly small participation in the programs' first or second years, such programs would likely have small impacts on peak demands in the near future. This same constraint would also operate on the peakload impacts of State and utility programs such as those implemented under the Residential Conservation Service Program of the National Energy Act.

A number of other programs are possible which could be targeted directly at reducing peak demands and would likely be more successful in reaching this goal. These programs include load-shaping rate strategies and load management programs. In contrast to many other conservation programs, these could be directly aimed at reducing peak demands. Rate or pricing strategies could be more successful than any other program in deferring the construction of transmission facilities. Generally though, power users react to rate changes slowly enough that peak demands would be only slightly altered in the near term in response to higher peak charges regardless of the magnitude of peak price change. (2) (3) (4) Transmission facilities proposed for FY 1981 would still be needed even if it were administratively possible to devise, analyze, and implement such rate schedules by this time. Load management programs might be developed to provide financial or other incentives for end-user or utility investment in load controlling technology. Again, this kind of program is not a feasible alternative to the transmission facilities included in the FY 1981 Proposed Program because of lags in implementing such programs and possible lags in getting response to such programs. In the long term, load management programs, as well as pricing strategies and other conservation programs, can play a more significant role in reducing the need for new transmission facilities as power users become aware of the programs, begin to recognize the self-benefits of investing in peak shaping technologies and/or reducing demands at certain times, and actually carry out these peak reduction investments and actions.

5. Direct Current (d-c) Transmission

Direct current (d-c) transmission lines have been used for purposes of moving large amounts of electricity over long distances. Because of the high cost associated with conversion between a-c and d-c, direct current transmission only becomes economical at line lengths of 400-600 miles (640-960 km) or greater. At such distances, the economic advantages of d-c offset the high cost of building converter stations at both ends of the line.

Environmental impacts associated with d-c transmission lines are virtually the same as those of a-c lines. D-c lines require only 2 conductors; accordingly, less tower steel and conductor cable, as well as fewer acres of right-of-way, are required for d-c line than an a-c line of comparable capacity. In addition, a lesser proportion of the load is lost on a d-c line than a comparable a-c line, resulting in greater conservation of energy.

For the Fiscal Year 1981 proposals, d-c transmission is not considered a feasible alternative since it would not offer any substantial environmental advantage for any of the new proposals included as part of the program, and the economic costs would be considerably greater.

6. Underground Conductor

Undergrounding of transmission lines would reduce the visual impact associated with overhead transmission lines, although a corridor would still be visible in timbered areas because of the clearing necessary to bury underground lines. Widths of right-of-way cleared for underground facilities (approximately 50 feet or 15 meters) would average less than the 50 to 165 feet (15-50 meters) required for above-ground construction, and the impact on existing land use would be reduced correspondingly.

Aside from the disadvantage of its considerable cost (which is generally 7-8 times that of equivalent overhead transmission lines),⁽⁵⁾ present technology imposes severe limitations on undergrounding with respect to maximum line length and carrying capacity. Underground lines cannot be as easily tapped or modified as overhead lines; and, while line outages are expected to be less frequent, undergrounding would likely jeopardize system reliability because underground failures are much more difficult to locate and repair.

Underground construction is a reasonable alternative to the normal above ground techniques primarily at lower voltages where existing technology can satisfactorily overcome the problems inherent in underground cables. Undergrounding, despite its high costs and technological limitations, is frequently the only alternative in highly congested urban areas where overhead rights-of-way may simply be unobtainable.

Underground transmission lines also create their own environmental impact. The trenching operations required to bury cables, and to gain access for repair of underground cables in case of failure, may disturb natural drainage systems and cause increased erosion. In rocky areas, excavation may require extensive blasting. Once the trench is backfilled, heat generated by underground cables has a drying effect on surrounding soil and would affect vegetation in the immediate cable area, and longitudinal erosion may occur in steep terrain. In addition, high-voltage underground transmission cables require installation of shunt reactors at frequent intervals which themselves create an additional impact upon land use.

A detailed description of the technological and economic constraints involved in undergrounding can be found in Appendix B of the "Role EIS" (chapter X.B.2). At this time, underground conductor is generally not a feasible alternative to the overhead construction included in the proposed construction program because of these constraints. However, BPA is currently involved in researching the

technology, and will consider this alternative further in future site-specific environmental impact statements and environmental assessments as appropriate.

7. Load-Center Generation

a. Combustion turbines

One alternative method which has been used to meet limited localized peaking power needs on an interim basis is the installation of a combustion turbine in the immediate area of the load. Combustion turbines can also be used for meeting forced outage reserve capacity, thereby maintaining adequate system reliability without requiring additional transmission lines. This, of course, would eliminate the need for long-distance transmission lines, although some local distribution lines would still be required.

Presently BPA markets bulk electrical energy and does not have congressional authority to own, operate, or install generating facilities, including turbines, except in some emergency situations. A change in BPA's current mandates would be necessary before BPA could take any action toward the installation of generation facilities in the Northwest. In some instances, however, BPA's utility customers can and have considered installing their own local generation as an alternative for their power demands.

Impacts resulting from the use of a combustion turbine include exhaust emissions, principally oxides of nitrogen and sulfur dioxide, in addition to sizeable consumption of increasingly scarce petroleum-based fuels. Of course, if fossil fuel oils are used as a fuel, then oil spills are always a danger. An additional factor of increasing public concern associated with these facilities, especially since they would be located in or adjacent to population or load centers, is the emission of vibrations in frequencies both at and below audible sound.

A limitation affecting the applicability of turbines is that all combustion turbines, though they may not be used as such, are designed and manufactured to serve peaking power requirements and therefore should not be considered a source for firm or base power requirements.

However, an advantage made obvious by past sabotage attempts on BPA's transmission facilities is that local generation facilities, including combustion turbines, can be more easily protected from sabotage and natural disaster than can long-distance transmission lines. For a more complete discussion of local combustion turbine generators as a substitute for new transmission facilities, see Appendix B of the "Role EIS" (chapter X.A.1-2.).

b. Biomass/Cogeneration

The technology for direct combustion of biomass for electrical generation is known and has been demonstrated. However, any biomass generation plant is likely to have a lead time of 3 to 4 years. The major new development in the field is fluidized bed combustion which may make the use of biomass fuels more economical. This has not yet been demonstrated. The most likely fuel in the Pacific Northwest during the 1980's is wood residue, both mill waste and forest slash, with a possible contribution from municipal solid waste. Approximately 80 percent of the cogeneration potential in the region is in the forest products industries, which would likely use wood residue as fuel.

BPA is currently involved in a number of projects concerning biomass and cogeneration:

(1) BPA and the U.S. Forest Service are jointly preparing a study for a 25 MW biomass woodfired generating plant utilizing forest logging residue as a fuel. The objective of the study is to identify institutional constraints, assure a fuel supply for the life of such a plant, identify the multiple benefits that can be derived from the land and forest management point of view, and determine if the production of electricity can be cost-effective and environmentally acceptable.

(2) BPA has retained Rocket Research Co. to study the cogeneration potential in the BPA service area. The first phase, which identified 1430 MW of cogeneration that is technically achievable, has been completed. The next phase is underway involving an economic, cost, and feasibility evaluation to determine what portion of the total potential is likely to be developed.

(3) BPA is cofunding feasibility investigations for Lewis County PUD in Washington and the Columbia Basin Electric Cooperative in Oregon which would use mill residue for cogeneration facilities in their respective areas. Each facility would involve 10-20 MW of generation. The studies will address generic considerations which will be applicable to other possible cogeneration sites in the Pacific Northwest, as well as enough site specific data so that the utilities can make a decision whether or not to proceed with design and construction of the plants.

(4) BPA is participating with the City of Tacoma, Tacoma City Light, Rocket Research Co., and a number of local industries in the Tacoma area in discussions that could lead to a predesign feasibility analysis of a cogeneration project. About 60 MW of generation, industrial process steam and residential, commercial and industrial heating are involved. Biomass wood waste products would be the primary fuel source augmented by municipal waste products.

B. MAINTENANCE AND RIGHT-OF-WAY MANAGEMENT

1. No Action

Failing to adequately maintain BPA electrical equipment and prevent vegetation from growing into BPA transmission lines would result in violations of reliability criteria, damage to electrical equipment, and increasingly frequent outages. This would severely disrupt the Pacific Northwest economy and, in some circumstances, jeopardize human life. The "no action" alternative is therefore generally unreasonable.

2. Maintenance of Electrical Equipment and Other Facilities

Routine and preventive line maintenance activities would be performed in accordance with established line maintenance schedules and standards. These activities would include maintaining airway lighting systems, repainting airway marked structures, replacing faded and damaged airway marker balls, repairing frayed and damaged conductors, inspection and repair of steel towers, inspection and replacement of wood poles and crossarms, replacing damaged and broken insulators, and the application of preservative to wood poles and crossarms. In addition to maintaining the structures, conductors, and rights-of-way, BPA would maintain gates on access roads and keep such roads in passable condition and properly surfaced to prevent erosion.

This maintenance alternative is a common supplement to each of the right-of-way management alternatives enumerated below; unwanted vegetation on access roads would be controlled by one of the methods discussed therein.

Helicopter patrols may disturb nearby residents, livestock, and wildlife. Where requested by a property owner, BPA would install detour signs on certain towers instructing the pilot to bypass the area.

Stream crossings may cause slight local degradation of water quality. Maintenance vehicles would cross streams only at approved crossings.

3. Hand and Mechanical Cutting

This alternative would involve the use of hand tools and chainsaws to control noxious weeds, tall-growing vegetation, and brush. Untreated stems and stumps would quickly resprout,* demanding the frequent attention of maintenance crews. Slash would be piled or lopped and scattered. This alternative would cause the greatest impact to soil and water resources and the greatest incidence of personal injury.

*Usually, hand and mechanical cutting is followed by treating the stumps with herbicide to prevent resprouting. This method is discussed under the alternative of herbicide use.

The exclusive use of hand and mechanical methods is generally not feasible for right-of-way vegetation management because it is inefficient. However, it may be feasible for individual sites where unwanted vegetation is not dense, the area is accessible, and great selectivity is desired.

Maintenance of electrical equipment would be performed as discussed in II.B.2. above.

4. Herbicide Use

Herbicides can be very effective in the control of unwanted vegetation. Herbicides suitable for BPA purposes are listed in Table 4. These herbicides would be applied under extremely close supervision. Where applied by contractors, BPA inspection would be exercised over the type of herbicide, the additives and thickeners used, and the rates of application. All herbicides would be applied at rates specified on the product label except where rates lower than specified have proven effective. Rates higher than those specified on the product label would never be used. Soil sterilants would be limited in use to areas where total elimination of vegetation is necessary, such as in substation yards and around some powerline structures. Application of soil sterilants would be under strict control to prevent contamination outside the target area. All BPA applicators (or their supervisors) and contractors would be required to be licensed by the State in which they operate. BPA would also coordinate closely with the various State agencies responsible for herbicide use, such as the State of Oregon Pesticide Use Clearinghouse. Only herbicides registered with the Environmental Protection Agency (EPA) would be used.

Herbicide application on rights-of-way may be accomplished by one or more of the following methods: (1) foliage treatment consists of applying a herbicide diluted with water onto the foliage of the target vegetation. Foliage treatment may be applied with ground equipment selectively or it can be broadcast aerially in which case both target and nontarget vegetation may be affected. Aerial foliage treatment is an effective method of control in highly inaccessible terrain and when controlling uniform stands of high growing vegetation where selectivity is not necessary. (2) Basal treatment consists of applying a mixture of herbicide and oil on the lower trunk of the target vegetation from about knee high (2 feet) to ground level. When applied during the dormant season, treated trees will normally not leaf out during the following season, thereby avoiding the vegetative brownouts associated with foliage treatment. (3) Frill, notch, or cup is a method employed in which a cut through the bark is made to the cambium layer in a series around the circumference of the trees. Liquid herbicide is poured into the notches. This can be done at any time of year, but is most effective when performed during the dormant season. This is the safest method near streams, sensitive plants, or other areas of concern where a high degree of selectivity is desirable. (4) Soil treatment refers to a method in which pelleted or granular herbicides are broadcast on the ground within the drip base of the tree or other target vegetation.

TABLE 4
HERBICIDES AND DRIFT CONTROL ADDITIVES USED BY BPA**

TRADE NAME	USDA or EPA Registration Number	Herbicide	Manufacturer	Ingredients		
Aatrex 80W	100-443-AA	Atrazine	Ciba-Geigy Chemical	Active Ingredient:	Atrazine . . . . .	.80 %
				Inert Ingredients:	. . . . .	.20 %
Ammate X	352-206-AA	Ammonium Sulfamate	Dupont	Active Ingredient:	Ammonium Sulfamate. . . . .	.95 %
				Inert Ingredients:	. . . . .	.5 %
Ammate X-NI	352-311	Ammonium Sulfamate	Dupont	Active Ingredient:	Ammonium Sulfamate. . . . .	.95 %
				Inert Ingredients:	. . . . .	.5 %
Banvel 4-OS	876-156-AA	Dicamba	Velsicol Chemical Corporation	Active Ingredients:	Dicamba (3,6-dichloro-o-anisic acid) . . . . .	.44.72%
				Related Acids . . . . .	. . . . .	6.68%
				Inert Ingredients:	. . . . .	.48.60%
Banvel 4-W.S.	876-159-AA	Dicamba	Velsicol Chemical Corporation	Active Ingredients:	Dimethylamine salt of dicamba (3,6-dichloro-o-anisic acid). . . . .	.49.0 %
				Dimethylamine salt of related acids . . . . .	. . . . .	7.9 %
				Inert Ingredients:	. . . . .	.43.1 %
Banvel-520	876-168-AA	Dicamba	Velsicol Chemical Corporation	Active Ingredients	Dicambe (3,6-dichloro-o-anisic acid) . . . . .	.11.50%
				Related Acids . . . . .	. . . . .	1.60%
				Isooctyl ester of 2,4-dichlorophenoxyacetic acid* . . . . .	. . . . .	.34.80%
				Xylene . . . . .	. . . . .	.25.75%
				Inert Ingredients:	. . . . .	.26.35%
				*Equivalent to 23.21% 2,4-dichlorophenoxyacetic acid		
Banvel-720	876-177-AA	Dicamba	Velsicol Chemical Corporation	Active Ingredients:	Dimethylamine salt of dicamba (3,6-dichloro-o-anisic acid). . . . .	.12.90%
				Dimethylamine salts of related acids. . . . .	. . . . .	1.80%
				Dimethylamine salt of 2,4-dichlorophenoxyacetic acid* . . . . .	. . . . .	.25.80%
				Inert Ingredients:	. . . . .	.59.50%
				*Equivalent to 21.43%, 2,4-dichlorophenoxyacetic acid		
Banvel XP Pellets	876-178-AA	Dicamba	Velsicol Chemical Corporation	Active Ingredients:	Dicamba. . . . .	.10 %
				Inert Ingredients:	. . . . .	.90 %
Casaron G4	148-614	Dichlobenil	Thomson- Hayward Chemical Corporation	Active Ingredient:	Dichlobenil . . . . .	.4 %
				Inert Ingredients:	. . . . .	.96 %
Karmex	252-247-AA	Diuron	DuPont	Active Ingredient:	Diuron. . . . .	.80 %
				Inert Ingredients:	. . . . .	.20 %
Krovar	352-352-AA	Bromacil, Diuron	DuPont	Active Ingredients:	Bromacil . . . . .	.40 %
					Diuron . . . . .	.40 %
				Inert Ingredients:	. . . . .	.20 %

** EPA registered herbicides may be added to this listing and may be substituted for those identified in the Vegetation Management Appendix when conditions require.

TABLE 4 (continued)
HERBICIDES AND DRIFT CONTROL ADDITIVES USED BY BPA

TRADE NAME	USDA or EPA Registration Number	Herbicide	Manufacturer	Ingredients
Pramitol 5PS	100-479-ZA	Prometone, Simazine, Sodium chlorate/ metaborate	Geigy Chemical Corporation	<u>Active Ingredients:</u> 2-methoxy-4,6-bis (isopro- pylamine)-S-triazine. 5.00% 2-chloro-4,6-bis (ethylamine)-S-triazine. 0.75% Sodium chlorate (NaClO ₃). 40.00% Sodium metaborate (Na ₂ B ₂ O ₅ ·5H ₂ O). 50.00% <u>Inert Ingredients:</u> 4.25%
Pramitol 25E	100-443-AA	Prometone	Geigy Chemical Corporation	<u>Active Ingredients:</u> 2-methoxy-4,y-bis (isopropylamino)- S-triazine. 25 % <u>Inert Ingredients:</u> 75 %
Princep 4G	100-435	Simazine	Ciba-Geigy Chemical	<u>Active Ingredient:</u> Simazine. 4 % <u>Inert Ingredients:</u> 96 %
Roundup	524-308	Glyphosate	Monsanto	<u>Active Ingredients:</u> Isopropylamine salt of Glyphosate 41 % <u>Inert Ingredients:</u> 59 %
Telvar	252-246	Monuron	DuPont	<u>Active Ingredients:</u> Monuron (3-(p-chlorophenyl)-1, l-dimethylurea. 80 % <u>Inert Ingredients:</u> 20 %
Tordon 10K	464-320	Picloram	Dow Chemical Company	<u>Active Ingredient:</u> 4-amino-3,5,6-trichloropico- linic acid* as the potassium salt 11.6 % <u>Inert Ingredients:</u> 88.4 % <u>Acid Equivalent:</u> 4-amino-3,5,6-trichloropico- linic acid. 10 %
*Known under the trademark TORDON				
Tordon 101	464-306	Picloram, Tordon, ATCP, 4-amino-3, 5,6-trichloropico- linic acid	Dow Chemical Company	<u>Active Ingredients:</u> 4-amino-3,5,6-trichloropico- linic acid as the trichloropropanolamine salt 10.2 % 2,4-dichlorophenoxyacetic acid as the triisopropanolamine salt. 39.6 % <u>Inert Ingredients:</u> 50.2 % <u>Acid Equivalent:</u> 4-amino-3,5,6-trichloropico- linic acid. 5.7 % 2,4-dichlorophenoxyacetic acid. 21.2 %
Ureabor	1624-90	Sodium chlorate/ metaborate, Bromacil	U.S. Borax	<u>Active Ingredients:</u> Sodium metaborate tetrahydrate (Na ₂ -B ₂ -O ₄ -4H ₂ O). 66.5 % Boron Trioxide (B ₂ O ₃) equivalent. 22.6 % Sodium Chlorate (NaClO ₃). 30.0 % Bromacil (5 bromo-3-sec-butyl-6-methyluracil) . . 1.5 % <u>Inert Ingredients:</u> 2.0 %
Weedone 170	264-222-AA	2,4-D, 2,4-DP	Amchem Products, Inc.	<u>Active Ingredients:</u> 2,4-Dichlorophenoxypropionic acid, butoxyethanol ester 31.1 % 2,4-Dichlorophenoxyacetic acid, buyoxyethanol ester 31.8 % <u>Inert Ingredients:</u> 37.1 %
Several	Several	2,4-D Amine	Several	<u>Ingredients:</u> Alkanolamine Salts of 2,4,-Dichloro- phenoxyocetic acid. 59.7 % (2,4-Dichlorophenoxyocetic Acid Equivalent) . . 38.6 % <u>Inert Ingredients:</u> 40 %

Note - The formulation may vary between manufacturers and this variation is reflected in the mixing requirements specified on the label. Separate registrations are required for individual formulation.

Some pellets sterilize the soil for a short period, while others affect only the plants around which the pellets are applied. This is an excellent method for controlling individual trees or in locations inaccessible to vehicles. (5) Cutting and stump treatment refers to cutting trees and brush, then spraying or painting the stumps with an oil or water based application of herbicide to prevent sprouting. The remaining slash would be piled or lopped and scattered.

Ground application of foliage sprays may be accomplished manually or by vehicular mounted equipment. Utilization of vehicular mounted equipment may require permanent access roads in addition to those required for electrical maintenance. For prescribed areas where these roads do not already exist, they would need to be constructed. The manual application of herbicides allows for the highest level of selectivity since individual plants can be treated by this method. In all ground applications, no herbicide would be applied closer than 10 feet to any body of water except in the case of chemicals which are safe to use near water. Rotomist ground application would not be permitted when the wind exceeds 10 mph.

Foliage application may also be done by aircraft. It is broadcast over a relatively wider area, affecting both target and non-target vegetation within the right-of-way. Selectivity is achieved through choice of herbicide mixture, rate, and timing of application. Aerial application would be done by helicopters. Helicopters are preferred over fixed wing aircraft because they can fly lower and more slowly and, as a consequence, direct the spray more closely to the target area. Relatively inaccessible terrain may warrant the use of aerial application in some situations. Aerial spraying may also be the preferred method when controlling uniform stands of conifers or other tall growing vegetation where selectivity within the area to be treated is unnecessary. In such situations aerial application would achieve the desired result in the most efficient manner. Because there are none of the heavy equipment access and slash disposal problems associated with other methods, aerial application along such sections of right-of-way may also have the least overall adverse environmental impact.

The visual impact of foliage applications would vary with the type and extent of the application, the species of the plant involved, time of year, and herbicide used. In some cases, treated vegetation appears as a single dead tree or a cluster of dead trees or brush. The visual impact of foliage application, however, can be quite extensive for at least one growing season.

Other potential impacts resulting from the application of herbicides are persistence of the chemical in soil, vegetation, wildlife, and water; damage to desirable vegetation within the right-of-way and nontarget vegetation off the right-of-way; alteration of wildlife habitat; and exposure to humans and livestock. Also, some herbicides may cause mortality to honeybees working in a treated area. It is uncertain to what extent bee mortality may occur.

Laboratory analyses and field monitoring have shown the herbicidal compounds that would be used by BPA to readily degrade in the environment and are readily excreted by animals. That is, they do not accumulate in the environment or in organisms.

When herbicides are to be used that have label restrictions on grazing of meat and dairy animals in treated areas, BPA would contact the owners/occupants of the areas to be treated. Every owner or occupant in areas where evidence of grazing exists would be personally notified of any pending application of herbicides with grazing restrictions. This would be accomplished by BPA personnel contacting owners/-occupants personally. Once personal contact has been made a completed and signed notice would be left as a reminder. When personal contact cannot be made a completed notice would be left at the residence, attached to the door. If after a week no response is received, an additional effort would be made to contact the owner/occupant. Owner response would be required to confirm that the notice was received; a self-addressed envelope would be attached to facilitate this. BPA would not make application of herbicides with grazing restrictions where personal owner/occupant contact has not been made.

One herbicide that would be used, 2,4-D, is possibly mutagenic and may affect reproduction. However, considering the diluted rates of application that would be used and the relatively rapid degradation of the chemical in the environment, the risk is extremely low for human or animal exposure at the doses required to produce these effects. Inadvertent exposure to herbicides would be further minimized because:

- a. herbicides would not be intentionally sprayed directly into streams, rivers, lakes, and other bodies of water;
- b. aerial application of herbicides would not be made within 100 feet (30 m) of a body of water; selective ground application would not be made within 10 feet (3 m), except for treatment of stumps with herbicides approved by EPA for use to water's edge;
- c. the potential for drift of herbicides would be minimized by thickening spray mixtures and prohibiting application entirely when wind velocity becomes too great: aerial application is restricted when wind velocity exceeds 6 mph (9.6 km/h), and ground application cannot take place when the velocity exceeds 10 mph (16 kmph);
- d. application would not be made during heavy rain or under the threat of heavy rain to minimize the movement of herbicides by surface runoff and to prevent contact herbicides from being washed off foliage before being absorbed by the target vegetation;
- e. the maximum release height for aerial application would be 160 feet above ground; and

f. all herbicide containers are rinsed three times before disposal. The resulting rinse solution is combined with the herbicide solution prior to application.

Accidental spills of a herbicide may occur. Such spills have a potential to cause extensive vegetation kill on and off the right-of-way. Cleanup and containment procedures are established which are designed to limit the adverse impacts of such an occurrence.

Adverse environmental impact could also result from the misapplication of herbicides. Inadvertent application or drift of herbicides off the right-of-way would, of course, affect nontarget vegetation. The incidence and severity of misapplication would be minimized by the maintenance of buffer zones, drift control additives, and other measures previously discussed. All reports of accidental spraying off the right-of-way would be investigated by BPA inspectors, samples of soil and vegetation for independent analysis taken when required, and compensation made for actual damages.

Maintenance of electrical equipment would be performed as discussed in II.B.2. above.

5. Multiple Vegetation Control Techniques

This alternative would combine hand and mechanical cutting with herbicide use to maximize efficiency and minimize environmental impact. For example: where the greatest selectivity is desired, hand-cutting and stump treatment would be utilized; where selectivity is still desirable, access is not a problem, and herbicide use would present little hazard, selective methods of herbicide application would be utilized; where selectivity is not a factor (such as dense, uniform stands of trees), access is a problem, and herbicide use would present little hazard, aerial application of herbicides would be utilized. Because the hazard of inadvertent exposure is minimal at substations, BPA would use herbicides there with no adverse environmental impact expected. As compared to exclusive reliance on herbicides, this alternative would introduce less total herbicides into the environment and allow the flexibility to minimize the potential for hazardous exposures. As compared to the exclusive use of hand and mechanical cutting, this alternative would reduce the use of access roads and resulting environmental impact. Therefore, this alternative is the environmentally preferable alternative.

The transmission line rights-of-way and substations where vegetation would be controlled, the vegetation management method that would be used, and the herbicides and amounts that would be used are listed in Table 5. In total, BPA would control vegetation on approximately 18,646 acres (7,454 ha) or 22.4 percent of the 83,371 acres (33,348 ha) in the BPA system that require periodic control. Of this, approximately 1,735 acres (702 ha) or 9.3 percent would be controlled by hand and mechanical cutting; approximately 13,321 acres (5,353 ha) or 71 percent by selective ground application of herbicides; and approximately 3,680 acres (1,489 ha) or 19.7 percent by aerial application of

herbicides. For the remaining 64,725 acres (25,890 ha) in the BPA system that require regular vegetation control, BPA plans no control measures in FY 1981. Unforeseen circumstances may develop prior to the implementation of this proposal that could change individual components of the program.

BPA would utilize the herbicides identified in Table 4. These herbicides would be applied by the techniques discussed in sections II.B.3. and IV.B.2., including all mitigation measures and measures to prevent inadvertent exposure. To further reduce the potential of exposing people and livestock to herbicides, all rights-of-way to be aerially sprayed would be preflown by the contractor and a BPA inspector to identify areas not to be sprayed such as near residences, bodies of water, recreation areas, and rangeland. To test the effectiveness of these measures, BPA would periodically monitor the fate and persistence of applied herbicides.

Where BPA transmission lines traverse forested areas, and the adjoining property owners are conducting an active weed control program, BPA would cooperate in the control and eradication of declared noxious weeds on its rights-of-way. BPA would control noxious weeds around its transmission line structures on cultivated land when the grower requests it to. BPA would use maintenance crews to control the weeds, contract with a county weed control agent or weed district, or supply herbicide to the property owner for him to apply.

BPA would encourage the multiple use of its rights-of-way and join in land use agreements with landowners. Any beneficial use of the land that would not conflict with maintaining a safe and reliable transmission system would be acceptable. Also, if a landowner objects to BPA vegetation management methods, BPA will join in a Tree and Brush Agreement allowing the owner to assume responsibility for the vegetation on the right-of-way. Benefits associated with the multiple use of BPA rights-of-way are (1) more productive use of the right-of-way land, (2) reduction of maintenance costs and time, and (3) reduction of herbicide use.

To further facilitate multiple use, BPA would also cooperate with land management agencies having jurisdiction over public lands with rights-of-way. Also, BPA would coordinate herbicide application on Indian reservations and public lands on a site-specific basis with the appropriate Indian tribe or land management agency.

Maintenance of electrical equipment would be performed as discussed in II.B.2 above.

TABLE 5

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

STATE OF Oregon

Portland Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting 1/ acres/ha.	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
		acres/ha.	acres/ha.			

Clackamas

Big Eddy-Oregon City 61/4 - 82/1	1/ .4			Banvel 520 399/ 161.4	3/ 11 399/1510
Big Eddy-Troutdale 44/5 - 66/5	2/ .8			Banvel 520 538/ 217.7	6/ 23 538/2037
Ostrander-Pearl 6/1 - 10/4	5/ 2.0			Banvel 520 75/ 30.3	15/ 57 75/ 284
Pearl -Marion 4/3 - 21/3	4/ 1.6			Banvel 520 108/ 43.7	12/ 45 108/ 409

Columbia

Keeler-Allston 17/3 - 18/3 A/R 20/2 - 42/2	7/ 2.8			Weedone 170 95/ 38.4	28/ 106 95/ 360
St. Johns-St. Helens 12/2 - 22/3 A/R	1/ .4			Banvel 520 6/ 2.4	3/ 11 6/ 23
St. Helens Tap to Longview-Astoria 1/1 - 23/2 A/R	4/ 1.6			Banvel 520 16/ 6.5	12/ 45 16/ 61

1/- Requires stump treatment of resprouting species.

2/ Weed control. This includes noxious weed control on right-of-way
and weed control around structures in agricultural land.

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Portland Area

STATE OF Oregon

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. <u>1</u> /	acres/ha.	acres/ha.		gal/liter	lb/kg

Coos

Fairview-Bandon #1 SS - SS	20/ 8.1	190/ 76.9	Weedone 170 Tordon 101 Tordon 10K	80/ 303 190/ 719	300/ 136
Fairview-Bandon #2 SS - SS	10/ 4.0	70/ 28.3	Weedone 170 Tordon 101 Tordon 10K	40/ 151 70/ 265	200/ 91
Reston-Fairview #1 9/6 - 30/8	5/ 2.0	395/ 159.8	Weedone 170 Tordon 101 Tordon 10K	20/ 76 395/1495	1000/ 454
Reston-Fairview #2 11/1 - 11/4 16/2 - 17/2 27/3 - 27/5		18/ 7.3	Tordon 101 Tordon 10K	18/ 68	50/ 23

Douglas

Alvey-Reston 21/6 - SS	20/ 8.1	200/ 80.9	Weedone 170 Tordon 101	80/ 303 200/ 757	
Reston-Fairview #1 2/1 - 9/6		160/ 64.7	Tordon 101 Tordon 10K	160/ 606	300/ 136

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Portland Area

STATE OF Oregon

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. 1/	acres/ha.	acres/ha.		gal/liter	lb/kg

Lane

Marion-Alvey	3/	1.2		Banvel 520	9/	34	
39/2 - SS			247/	99.9	Banvel 720	247/	935
Marion-Lane			130/	52.6	Banvel 720	130/	492
SS - SS							
Alvey-Reston	5/	2.0		Weedone 170	20/	76	
SS - 21/6			65/	26.3	Tordon 101	65/	246
Lane-Tahkenitch #1	25/	10.1		Weedone 170	100/	378	
SS - SS A/R			50/	20.2	Tordon 101	50/	189
				Tordon 10K			300/ 136

Linn

Salem-Albany #1	1/	.4		Banvel 520	3/	11	
14/6 - SS			5/	2.0	Banvel 720	5/	19
Marion-Alvey	2/	.8		Banvel 520	6/	23	
SS - 39/2			148/	59.9	Banvel 720	148/	560
Santiam-Alvey			300/	121.4	Banvel 720	300/	1136
SS - 39/3							

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Portland Area

STATE OF Oregon

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.1/	acres/ha.	acres/ha.		gal/liter	lb/kg

Marion

McNary-Santiam #2	300/	121.4		Tordon 101	600/2271
157/4 - 180/1				2,4-D Amine	150/ 568
			20/ 8.1	Tordon 101	20/ 76
Pearl -Marion	6/	2.4		Banvel 520	18/ 68
21/3 - 39/5			117/ 47.3	Banvel 720	117/ 443
Salem-Albany #1	1/	.4		Banvel 520	3/ 11
SS - 14/6			8/ 3.2	Banvel 720	8/ 30

Multnomah

Big Eddy-Troutdale			160/ 64.7	Banvel 720	160/ 606
66/5 - 77/3					
Keeler-Allston	1/	.4		Weedone 170	4/ 15
7/4 - 10/4			5/ 2.0	Weedone 170	5/ 19
St. Johns Tap to Keeler					
Oregon City #2	5/	2.0		Banvel 520	15/ 57
2/1 - 5/11			5/ 2.0	Banvel 720	5/ 19
St. Johns-St. Helens	3/	1.2		Banvel 520	9/ 34
2/3 - 12/2 A/R			10/ 4.0	Banvel 720	10/ 38

TABLE 5 (cont'd)

BPA's FY 19 81 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Portland Area

STATE OF Oregon

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. <u>1</u> /	acres/ha.	acres/ha.		gal/liter	lb/kg

Polk

Salem-Albany #2	2/	.8		Banvel 520	6/	23
SS - 20/2			18/	7.3	Banvel 720	18/ 68
Salem-Tillamook	1/	.4		Banvel 520	3/	11
SS- 35/2			9/	3.6	Banvel 720	9/ 34

Tillamook

Salem-Tillamook	1/	.4		Banvel 520	3/	11
39/1 - SS			9/	3.6	Banvel 720	9/ 34
Forest Grove-Tillamook	3/	1.2		Banvel 520	9/	34
3/1 - SS A/R			27/	10.9	Banvel 720	27/ 102

Washington

Keeler-Allston	2/	.8		Weedone 170	8/	30
1/3 - 7/4			40/	16.2	Weedone 170	40/ 151
10/4 - 17/3						
18/3 - 20/2						

Yamhill

Salem-Tillamook	1/	.4		Banvel 520	3/	11
35/2 - 39/1			9/	3.6	Banvel 720	9/ 34
Carlton-Tillamook	3/	1.2		Banvel 520	9/	34
SS - 13/1			27/	10.9	Banvel 720	27/ 102

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Portland Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. 1/	acres/ha.	acres/ha.		gal/liter	lb/kg

Clark

McNary-Ross	5/	2.0		Banvel 520	15/	57
161/1 - 176/2			27/	10.9	Banvel 720	27/ 102
N. Bonneville-Ross #1			76/	30.7	Tordon 101	152/ 575
15/5 - 36/1					2,4-D	38/ 144
			230/	93.1	Banvel 720	230/ 871

Skamania

McNary-Ross	5/	2.0		Banvel 520	15/	57
144/2 - 149/3			95/	38.4	Banvel 720	95/ 360
N. Bonneville-Ross #1			324/	131.1	Tordon 101	648/2453
1/1 - 15/4					2,4-D	162/ 613
			160/	64.7	Banvel 720	160/ 606

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. 1 /	acres/ha.	acres/ha.		gal/liter	lb/kg

Chelan

Chief Joseph-Monroe	20/	8.1		Tordon 101	20/	76
from 64/5 to 80/1			100/	Banvel 4WS	50/	189
				2,4-D Amine	100/	379

Clallam

Fairmount-Port Angeles No. 2	20/	8.1		Tordon 101	20/	76
from 4/3 to 27/8			100/	Banvel 4WS	50/	189
				2,4-D Amine	100/	379
Port Angeles-Sappho No. 1	20/	8.1		Tordon 101	20/	76
from 1/1 to 42/10			100/	Banvel 4WS	50/	189
				2,4-D Amine	100/	379

Cowlitz

Lexington-Longview No. 1	10/	4.1		Tordon 101	10/	38
from 1/1 to 9/9			50/	Banvel 4WS	25/	95
				2,4-D Amine	50/	189
			80/	Banvel 4WS	20/	76
				2,4-D Amine	40/	151

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

STATE OF Washington

Seattle Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
		acres/ha. 1/	acres/ha.		acres/ha.	gal/liter	lb/kg

Cowlitz (cont.)

Longview-Chehalis No. 1 from 7/7 to 12/2	16/ 6.5	80/ 32.4	Tordon 101	16/ 61
			Banvel 4WS	40/ 151
			2,4-D Amine	80/ 303
	124/ 50.2 ^{2/}		Banvel 4WS	31/ 117
			2,4-D Amine	62/ 235
Paul-Allston No. 2 from 29/1 to 55/4	20/ 8.1	100/ 40.5	Tordon 101	20/ 76
			Banvel 4WS	50/ 189
			2,4-D Amine	100/ 379
			Banvel 4WS	50/ 189
			2,4-D Amine	100/ 379

Grays Harbor

Olympia-Aberdeen No. 3 from 13/4 to 46/3	278/ 112.5 ^{2/}		Banvel 4WS	95/ 360
			2,4-D Amine	189/ 715

King

Chief Joseph-Monroe No. 1 from 80/1 to 100/2	10/ 4.1	50/ 20.2	Tordon 101	10/ 38
			Banvel 4WS	25/ 95
			2,4-D Amine	50/ 189

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
	acres/ha. 1/	acres/ha.	acres/ha.			

King (cont.)

Covington-Columbia No. 3 from 1/1 to 44/2	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
Covington-Duwamish from 1/1 to 9/5	8/ 3.2	40/ 16.2	Tordon 101 Banvel 4WS 2,4-D Amine	8/ 30 20/ 76 40/ 151
Covington-White River from 1/1 to 8/4	16/ 6.5	83/ 33.6	Tordon 101 Banvel 4WS 2,4-D Amine	16/ 61 42/ 159 83/ 314
Raver-Covington No. 1 & 2 from 1/1 to 10/6	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
Raver-Monroe No. 1 from 1/1 to 65/5	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
Raver-Paul No. 1 from 1/1 to 14/3	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379

TABLE 5 (cont'd)
BPA's FY 19 81 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. <u>1</u> /	acres/ha.	acres/ha.		gal/liter	lb/kg

King (cont.)

Rocky Reach-Maple Valley No. 1	60/24.3			Tordon 101	60/ 227
from 89/2 to 128/5		300/121.4		Banvel 4WS	150/ 568
				2,4-D Amine	300/1136
Sickler-Raver No. 1	60/24.3			Tordon 101	60/ 227
from 83/1 to 117/3		300/121.4		Banvel 4WS	150/ 568
				2,4-D Amine	300/1136
Tacoma-Raver No. 1 & 2	20/ 8.1			Tordon 101	20/ 76
from 2/5 to 15/4		100/ 40.5		Banvel 4WS	50/ 189
				2,4-D Amine	100/ 379
		100/ 40.5 ^{2/}		Banvel 4WS	25/ 95
				2,4-D Amine	50/ 189

Kitsap

Kitsap-Bremerton No. 1	7/ 2.8			Tordon 101	7/ 26
from 1/1 to 4/20		18/ 7.3		Banvel 4WS	9/ 34
				2,4-D Amine	18/ 68
Olympia-kitsap No. 3	20/ 8.1			Tordon 101	20/ 76
from 43/1 to 51/2		100/ 40.5		Banvel 4WS	50/ 189
				2,4-D Amine	100/ 379

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

Kittitas

Rocky Reach-Maple Valley No. 1	16/	6.5			Tordon 101	16/	61
from 75/1 - 89/2			80/	32.4	Banvel 4WS	40/	151
					2,4-D Amine	80/	303
Sickler-Raver No. 1	20/	8.1			Tordon 101	20/	76
from 76/1 - 83/1			100/	40.5	Banvel 4WS	50/	189
					2,4-D Amine	100/	379

Lewis

Chehalis-Centralia No. 2	8/	3.2			Tordon 101	8/	30
from 10/5 - 15/20			40/	16.2	Banvel 4WS	20/	76
					2,4-D Amine	40/	151
Chehalis-Mayfield No. 2	20/	8.1			Tordon 101	20/	76
from 1/1 - 22/4			100/	40.5	Banvel 4WS	50/	189
			80/	32.4 ^{2/}	2,4-D Amine	100/	379
					Banvel 4WS	20/	76
					2,4-D Amine	40/	151
Chehalis-Olympia	20/	8.1			Tordon 101	20/	76
from 1/1 - 14/1			100/	40.5	Banvel 4WS	50/	189
			60/	24.3 ^{2/}	2,4-D Amine	100/	379
					Banvel 4WS	15/	57
					2,4-D Amine	30/	114

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. <u>1</u> /	acres/ha.	acres/ha.		gal/liter	lb/kg

Lewis (cont.)

Mossy Rock-Chehalis No. 1 from 7/1 to 11/9	8/ 3.2			Tordon 101	8/ 30
		40/ 16.2		Banvel 4WS	20/ 76
				2,4-D Amine	40/ 151
Paul-Allston No. 2 from 1/1 to 29/1	40/ 16.2			Tordon 101	40/ 151
		198/ 80.1		Banvel 4WS	99/ 375
		800/323.8 ^{2/}		2,4-D Amine	198/ 750
				Banvel 4WS	200/ 757
				2,4-D Amine	400/1514
		100/ 40.5 ^{2/}		Banvel 4WS	25/ 95
				2,4-d Amine	50/ 189
Raver-Paul No. 1 from 64/5 to 70/6	10/ 4.1			Tordon 101	10/ 38
		50/ 20.2		Banvel 4WS	25/ 95
				2,4-D Amine	50/ 189

Mason

Olympia-Kitsap No. 3 from 20/3 to 43/1	40/16.2			Tordon 101	40/ 151
		200/ 80.9		Banvel 4WS	100/ 379
				2,4-D Amine	200/ 757
Olympia-Port Angeles No. 1 from 20/4 to 32/5		102/ 41.3 ^{2/}		Banvel 4WS	26/ 98
				2,4_D Amine	51/ 193

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

STATE OF Washington

Seattle Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. <u>1</u> /	acres/ha.	acres/ha.		gal/liter	lb/kg

Pacific

Chehalis-Raymond from 21/8 to 45/12	60/ 24.3 ^{2/}	Banvel 4WS 2,4-D Amine	15/ 57 30/ 114
Holcomb-Naselle No. 1 from 1/1 to 21/11	20/ 8.1 100/ 40.5	Tordon 101 Banvel 4 WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
	41/ 16.6 ^{2/}	Banvel 4WS 2,4-D Amine	11/ 42 21/ 79
Naselle-Long Beach No. from 12/3 to 17/9	10/ 4.1 50/ 20.2	Tordon 101 Banvel 4WS 2,4-D Amine	10/ 38 25/ 95 50/ 189
Naselle Tap to Longview- Astoria No. 1 from 31/1 to 35/2	4/ 1/6	Tordon 101 Banvel 4WS 2,4-D Amine	4/ 15 10/ 38 20/ 76

Pierce

Olympia-Grand Coulee No. 1 from 21/5 to 54/4	30/ 12.1 150/ 60.7	Tordon 101 Banvel 4WS 2,4-D Amine	30/ 114 75/ 284 150/ 568
Olympia-White River from 21/5 to 51/5	200/ 80.9 ^{2/}	Banvel 4WS 2,4-d Amine	50/ 189 100/ 379

TABLE 5 (cont'd)

BPA's FY 19 81 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
		acres/ha. <u>1</u> /	acres/ha.				acres/ha.

Pierce (cont.)

Raver-Paul No. 1	40/ 16.2		Tordon 101	40/ 151
from 14/3 to 48/1		200/ 80.9	Banvel 4WS	100/ 379
		600/242.8 ² /	2,4-D Amine	200/ 757
			Banvel 4Ws	150/ 568
			2,4-D Amine	300/1136

Tacoma-Cowlitz Tap to	8/ 3.2		Tordon 101	8/ 30
Chehalis-Covington No. 1		40/ 16.2	Banvel 4Ws	20/ 76
from 1/1 to 6/12		50/ 20.2 ² /	2,4-D Amine	40/ 151
			Banvel 4WS	13/ 49
			2,4-D Amine	25/ 95

Tacoma-Cowlitz Tap to	8/ 3.2		Tordon 101	8/ 30
Olympia-White River No. 1		40/ 16.2	Banvel 4WS	20/ 76
from 1/1 to 6/13		48/ 19.4 ² /	2,4-D Amine	40/ 151
			Banvel 4WS	12/ 45
			2,4-D Amine	24/ 91

Skagit

Monroe-Custer No. 1	36/ 14.6		Tordon 101	36/ 136
from 34/4 to 60/3		180/ 72.8	Banvel 4WS	90/ 341
			2,4-D Amine	180/ 681

Monroe-Custer No. 2	36/ 14.6		Tordon 101	36/ 136
from 34/4 to 59/5		180/ 72.8	Banvel 4WS	90/ 341
			2,4-D Amine	180/ 681

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
		acres/ha. <u>1</u> /	acres/ha.		acres/ha.	gal/liter	lb/kg

Snohomish

Chief Joseph-Monroe No. 1 from 100/2 to 121/4	12/ 4.9	53/ 21.4	Tordon 101 Banvel 4WS 2,4-D Amine	12/ 45 27/ 102 53/ 201
Chief Joseph-Snohomish NO. 3 & 4 from 100/3 to 105/1	4/ 1.6	20/ 8.1	Tordon 101 Banvel 4WS 2,4-D Amine	4/ 15 10/ 38 20/ 76
Jim Creek Service from 1/1 to 10/5	12/ 4.9	60/ 24.3	Tordon 101 Banvel 4WS 2,4-D Amine	12/ 45 30/ 114 60/ 227
Raver-Monroe No. 1 from 65/5 to 74/4	8/ 3.2	40/ 16.2	Tordon 101 Banvel 4WS 2,4-D Amine	8/ 30 20/ 76 40/ 151
Snohomish-Murray No. 1 from 1/1 to 18/6	10/ 4.1	50/ 20.2	Tordon 101 Banvel 4WS 2,4-D Amine	10/ 38 25/ 95 50/ 189
Snohomish-Bothell No. 1 from 1/1 to 8/11	10/ 4.1	50/ 20.2	Tordon 101 Banvel 4WS 2,4-D Amine	10/ 38 25/ 95 50/ 189

TABLE 5 (cont'd)
BPA's FY 19 81 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
	acres/ha. 1/	acres/ha.	acres/ha.			

Thurston

Chehalis-Olympia No. 1 from 14/1 to 30/12	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
Olympia-Aberdeen No. 3 from 1/1 to 13/4	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
Olympia-Grand Coulee No. 1 from 1/1 to 21/5	30/ 12.1	150/ 60.7	Tordon 101 Banvel 4WS 2,4-D Amine	30/ 114 75/ 294 150/ 568
Olympia-White River from 1/1 to 21/5		98/ 39.7 ^{2/}	Banvel 4WS 2,4-D Amine	25/ 95 49/ 185
Paul-Olympia from 1/3 to 21/4		200/ 80.9 ^{2/}	Banvel 4WS 2,4-D Amine	50/ 189 100/ 379
Raver-Paul No. 1 from 48/1 to 64/5	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
		300/ 121.4 ^{2/}	Banvel 4WS 2,4-D Amine	75/ 284 150/ 568

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Seattle Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha. 1/	acres/ha.	acres/ha.		gal/liter	lb/kg

Wahkiakum

Naselle Tap to the Longview- Astoria No. 1 from 6/1 to 31/1	30/ 12.1	150/ 60.7	Tordon 101 Banvel 4WS 2,4-D Amine	30/ 114 75/ 284 150/ 568
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Whatcom

Custer-Ingledow No. 1 & 2 from 1/1 to 9/6	16/ 6.5	80/ 32.4	Tordon 101 Banvel 4WS 2,4-D Amine	16/ 61 40/ 151 80/ 303
Custer-Intalco No. 1 from 1/1 to 7/4	6/ 2.4	30/ 12.1	Tordon 101 Banvel 4WS 2,4-D Amine	6/ 23 15/ 57 30/ 114
Custer-Intalco No.2 from 1/1 to 7/5	6/ 2.4	30/ 12.1	Tordon 101 Banvel 4WS 2,4-D Amine	6/ 23 15/ 57 30/ 114
Monroe-Custer No. 1 from 60/3 to 88/1	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379
Monroe-Custer No. 2 from 59/5 to 87/4	20/ 8.1	100/ 40.5	Tordon 101 Banvel 4WS 2,4-D Amine	20/ 76 50/ 189 100/ 379

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Spokane Area

STATE OF Montana

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

LAKE

Kalispell-kerr 22/7 - 35/3	3.0/ 1.2 ^{1/}	Tordon 101	.1/ .4
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LINCOLN

Bonnars Ferry-Troy 1/1 - 29/2	10.0/ 4.0 ^{1/}	Tordon 101	.1/ .4
Libby-Conkelley 1/1 - 24/1	37/ 14.9 ^{3/}	Tordon 101	37.0/140.0
Noxon-Libby 12/2 - 70/3	38/ 15.4 ^{3/}	Tordon 101	38.0/143.8

MINERAL

Dworshak-Hot Springs 54/1 - 93/1	5.0/ 2.01 ^{1/}	Tordon 101	.5/ 1.9
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MISSOULA

Hot Springs-Anaconda 63/1 - 80/1	3.0/ 1.2 ^{1/}	100/ 40.5 ^{2/}	Tordon 101 200.0/757.0
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TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

STATE OF Montana

Spokane Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.			

SANDERS

Dworshak-Hot Springs 117/5 - 122/1	18.0/	7.3 ^{1/}		Tordon 101	1.0/	3.8
Noxon-Hot Springs 1/1 - 57/1	3.0/	1.2 ^{1/}	100/	40.5 ^{2/} Tordon 101	200.0/	757.0
Noxon-Libby 7/1 - 12/2			14/	5.6 ^{3/} Tordon 101	14.0/	52.9

II-37

^{3/} Access roads.

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Spokane Area

STATE OF Montana

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

POWELL

Hot Springs-Anaconda 42/1 - 48/1	2.0/	0.8 ^{1/}		Tordon 101	.1/	.4
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DEER LODGE

Hot Springs-Anaconda 134/7 - 147/1	2.0/	0.8 ^{1/}	200/ 80.9 ^{2/} 1/ .4 ^{4/}	Tordon 101 Telvar	400.0/1514.2	20.0/ 9.0
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FLATHEAD

Columbia Falls-Trego 18/4 - 28/1	4.0/	1.6 ^{1/}		Tordon 101	.1/	.3
Hungry Horse-Columbia Falls 1/1 - 7/10	20.0/	8.1 ^{1/}		Ammate XNI		40.0/ 18.2
Hungry Horse-Conkelley 1/1 - 8/2	40.0/	16.2 ^{1/}		Ammate XNI		80.0/ 36.3
Kalispell-Kerr 34/1 - 35/3	5.0/	2.0 ^{1/}		Tordon 101	.5/	1.9
Libby-Conkelley 24/1 - 26/4			2/ .8 ^{3/}	Tordon 101	2.0/	7.6
Noxon-Libby 45/1 - 46/1			2/ .3 [/]	Tordon 101	2.0/	7.6

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

STATE OF Montana

Spokane Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

GRANITE

Hot Springs-Anaconda 48/1 - 50/1	1.0/	.4 ^{1/}	Tordon 101	.1/	.3
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LAKE

Kalispell-Kerr 22/7 - 228	5.0/	2.0 ^{1/}	Tordon 101	.2/	1.9
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Hot Springs-Anaconda 1/1 - 30/1	2.0/	0.8 ^{1/}	Tordon 101	.2/	.6
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MISCELLANEOUS COUNTIES

Miscellaneous Lines	32.0/	14.1 ^{1/}	Tordon 101	3.0/	11.3
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^{4/} Structure weed control.

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Spokane Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

CHELAN

Chief Joseph-Monroe Corridor 36/4 - 50/1	1/	.4 ^{1/}	100/	40.5 ^{2/}	Tordon 101	200.1/ 757
Grand Coulee-Raver Corridor 74/1 - 77/2			100/	40.5 ^{2/}	Tordon 101	200.0/ 757
Olympia-Grand Coulee 100/1 - 155/1			100/	40.5 ^{2/}	Tordon 101	200.0/ 757

COLUMBIA

Little Goose-Lower Granite 28/1 - 34/2			100/	40.5 ^{2/}	Tordon 101	200.0/ 757
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DOUGLAS

Grand Coulee-Okanogan #1 from 1/1 - 3/1	125/	50.5 ^{2/}	Tordon 101	250.0/ 946	
	1/	.4 ^{1/}	Telvar		20/ 91
Grand Coulee-Okanogan #2 1/1 - 3/1	100/	40.0 ^{2/}	Tordon 101	200.0/ 757	

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Spokane Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

GRANT

Grand Coulee-Hanford 17/1 - 77/2	2/ .8 ¹ / ₂	100/ 40.5 ² / ₄	Tordon 101 Telvar	200.0/ 757	20/ 91
Waluke Tap 11/1 - 11/2	1/ .4 ¹ / ₂		Tordon 101	.1/ 0	

KITTITAS

Covington-Columbia 58/1 - 68/2		50/ 20.2 ² / ₂	Tordon 101	100.0/ 378	
Grand Coulee-Raver # 1 91/1 - 120/1		50/ 20.2 ² / ₂	Tordon 101	100.0/ 378	
Midway-Pot Holes 19/2 - 19/3	1/ .4 ¹ / ₂		Tordon 101	.1/ 0	
Olympia-Grand Coulee #1 95/1 - 100/1		50/ 20.2 ² / ₂	Tordon 101	100.0/ 378	
Rocky Reach-Maple Valley 48/5 - 62/5		50/ 20.2 ² / ₂	Tordon 101	.2/ 0	
Sickler-Raver 34/5 - 40/1		50/ 20.2 ² / ₂	Tordon 101	100.0/ 378	
Vantage-Raver 34/1 - 41/1		50/ 20.2 ² / ₂	Tordon 101	100.0/ 378	

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE.

STATE OF Washington

Spokane Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

LINCOLN

Grand Coulee-Bell 1 thru 5
from 1/1 to 2/1100/ 40.5^{2/}_{4/} Tordon 101 200.0/ 757.0
1/ .4^{1/} Telvar 20/ 76

OKANOGAN

Winthrop Tap
from 1/1 - 2/150/ 20.2^{2/} Tordon 101 100.0/ 378.0

PEND OREILLE

Bell-Boundary #1 & 2
from 45/3 - 59/127.0/ 10.9^{1/} Tordon 101 .5/ 1.9Sacheen-Albeni Falls
from 6/1 - 12/2100/ 40.5^{2/} Tordon 101 100.0/ 379.0

SPOKANE

Bell-Colville
11/5 - 12/22.0/ .8^{1/} Tordon 101 .1/ 0.4Cheney Tap
3/8 - 4/21.0/ .4^{1/} Tordon 101 .1/ 0.4Grand Coulee-Bell 1 thru 5
from 70/1 - 75/1100/ 40.5^{2/} Tordon 101 200.0/ 757.0Green Bluff Tap
from 6/1 - 7/13.0/ 1.2^{1/} Tordon 101 .1/ 0.4

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Spokane Area

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

STEVENS

Addy-Cusick 2.0/ .8¹/₂ 50/ 20.2²/₅ Tordon 101 100.0/ 378.0
from 2/9 - 13/5

Bell-Colville 2.0/ .8¹/₂ Tordon 101 .1/ 0.4
49/3 - 50/1

MISCELLANEOUS COUNTIES

Miscellaneous Lines 50.0/ 20.2¹/₂ Tordon 101 5.0/ 18.9

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Spokane Area

STATE OF Idaho

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

SHOSHONE

Dworshak-Hot Springs 6/ 2.4^{1/} 100/ 40.5^{2/} Tordon 101 200.0/ 757.0
 32/1 - 85/1

MISCELLANEOUS COUNTIES

Miscellaneous Lines 20.0/ 6.1^{1/} Tordon 101 2.0/ .8

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Walla Walla Area

STATE OF Idaho

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

Bonneville

Palisades-Goshen from 11/ - 28/2	8/ 3	6/ 2	Tordon 101	4/ 15
Swan Valley-Teton from 3/7 - 13/4	7/ 3	8/ 3	Tordon 101	3/ 11

Elmore

Anderson Ranch-Mt. Home from 0/1 - 17/8	2/ 1	9/ 4	Karmex Tordon 101	1/ 4	125/ 57
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Gem

Black Canyon-Emmett from 1/1 - 4/16	2/ 1	4/ 2	Karmex Tordon 101	1/ 4	60/ 27
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Teton

Swan Valley-Teton from 13/4 - 22/9	4/ 2	9/ 4	Tordon 101	2/ 8
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BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE

Walla Walla Area

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.			

II-47

40/ 152

200/ 757

500/ 227

20/ 76

40/ 152

20/ 76

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Walla Walla Area

STATE OF Oregon

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

Wasco

Big Eddy-Troutdale from 15/1 - 18/1	20/ 8	Tordon 101	25/ 95
Celilo-Sylmar from 1/1 - 56/3	8/ 3	Telvar	120/ 54
Hood River-The Dalles from 5/5 - 15/5	5/ 2	Tordon 101	8/ 30
John Day-Big Eddy No. 1 from 9/4 - 19/4	12/ 5	Telvar	180/ 82
John Day-Big Eddy No. 2 from 9/4 - 19/4	10/ 4	Telvar	150/ 68
John Day-Marion from 15/2 to 75/3	5/ 2	Tordon 101 Telvar	40/ 152 270/ 122
McNary-Santiam from 136/1 - 150/3	48/ 19	Tordon 101	50/ 190

TABLE 5 (cont'd)

STATE OF Washington

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide			gal/liter	lb/kg
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.			

Franklin

Lower Monomental-Hanford
from 2/1 - 43/3

30/ 12

Telvar

450/ 204

Klickitat

Big Eddy-Midway
from 32/2 - 49/1

25/ 10

Tordon 101

25/ 95

McNary-Ross
from 102/4 - 116/2

50/ 20

Tordon 101

60/ 227

North Bonneville-Midway
from 27/1 - 80/3

20/8 8

119/ 48

Tordon 101

150/ 568

Skamania

McNary-Ross
from 116/2 - 144/4

52/ 21

136/ 55

Tordon 101

225/ 852

North Bonneville-Midway
from 1/1 - 27/1

37/ 15

76/ 31

Tordon 101

90 / 340

Yakima

Hanford-Ostrander
from 69/1 - 74/4

7/ 3

Tordon 101

10/ 38

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT OF WAY MANAGEMENT PROGRAM BY
COUNTY AND TRANSMISSION LINE
Walla Walla Area

STATE OF Wyoming

County Transmission Line	Area of each Management Method			Herbicide	Application per Line	
	Hand Cutting	Herbicide				
		Aerial	Selective			
	acres/ha.	acres/ha.	acres/ha.		gal/liter	lb/kg

Lincoln

Swan Valley-Teton
from 22/9 - 35/2

4/ 2

5/ 2

Tordon 101

2/ 8

TABLE 5 (cont'd)

BPA's FY 19 81 RIGHT-OF-WAY MANAGEMENT PROGRAM BY
BLM DISTRICT AND WORK UNIT

Coos Bay

Area

State of Oregon

Area of each Management Method			Herbicide	Application per Line	
Hand Cutting	Herbicide				
	Aerial	Selective			
acres/ha.	acres/ha. 1 /	acres/ha.		gal/liter	lb/kg

Fairview-Bandon #1
3/2 - 11/5

30/ 12.1 Tordon 101 30/ 114

TABLE 5 (cont'd)
 BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM BY
 BLM DISTRICT AND WORK UNIT
Roseburg Area
 State of Oregon

Area of each Management Method			Herbicide	Application per Line	
Hand Cutting	Herbicide				
	Aerial	Selective			
acres/ha.	acres/ha. <u>1</u> /	acres/ha.		gal/liter	lb/kg

Alvey-Reston
 23/1 - 51/1 All Lands
 and A/R

20/ 8.1 Tordon 101 20/ 76

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM BY
BLM DISTRICT AND WORK UNIT

Salem

Area

Oregon

State of

Area of each Management Method			Herbicide	Application per Line	
Hand Cutting	Herbicide				
	Aerial	Selective			
acres/ha. 1/	acres/ha. .	acres/ha.		gal/liter	lb/kg

Big Eddy-Troutdale
44/5 - 53/1

15/ 6.1 Banvel 720 15/ 57

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Portland Area

Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.			

Mt. Hood National Forest
Zig Zag District

Line Name

Big Eddy-Troutdale				
From 49/4 to 50/1	13/	32.1	Banvel 720	13/ 49
Marion-Alvey				
From 38/5 to 50/6	47/	19.0	Banvel 720	47/ 178
Marion-Lane				
From 38/5 to 50/3	25/	10.0	Banvel 720	25/ 95

Willamette National Forest
Detroit District

Line Name

McNary-Santiam #2				
From 157/4 to 180/1	300/	121.4	Tordon 101	600/2271
			2,4-D Amine	150/ 568
	20/	8.1	Tordon 101	20/ 76

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
 BY NATIONAL FOREST AND DISTRICT
 Seattle Area
 Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha. 1/	acres/ha.	acres/ha.			

Olympic National ForestSolduc Ranger District

Port Angeles-Sappho No. 1	10/ 4.1		Tordon 101	10/ 38
from 25/6 to 40/2		50/ 20.2	Banvel 4WS	25/ 95
			2,4-D Amine	50/ 189

Snoqualmie National ForestNorth Bend Ranger District

Covington-Columbia No. 3	10/ 4.1		Tordon 101	10/ 38
from 23/5 to 44/2		50/ 20.2	Banvel 4WS	25/ 95
			2,4-D Amine	50/ 189

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Seattle Area

Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide				
	Aerial	Selective			
acres/ha. <u>1/</u>	acres/ha.	acres/ha.		gal./liter	lb/kg

Snoqualmie National Forest (cont.)

North Bend Ranger District (cont.)

Sickler-Raver No. 1	40/ 16.2		Tordon 101	40/ 151
from 83/1 to 112/5		200/ 80.9	Banvel 4WS	100/ 379
			2,4-D Amine	200/ 757

Skykomish Ranger District

Chief Joseph-Monroe No. 1	20/ 8.1		Tordon 101	20/ 76
from 80/1 to 108/5		100/ 40.5	Banvel 4WS	50/ 189
			2,4-D Amine	100/ 379

Wenatchee National Forest

Cle Elum Ranger District

Rocky Reach-Maple Valley No. 1	16/ 6.5		Tordon 101	16/ 61
from 79/1 to 89/2		80/ 32.4	Banvel 4WS	40/ 151
			2,4-D Amine	80/ 303
Sickler-Raver No. 1	16/ 6.5		Tordon 101	16/ 61
from 78/2 to 83/1		80/ 32.4	Banvel 4WS	40/ 151
			2,4-D Amine	80/ 303

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Seattle Area

Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha. 1/	acres/ha.	acres/ha.			

Wenatchee National Forest (cont.)Lake Wenatchee Ranger District

Chief Joseph-Monroe No. 1
from 64/5 - 80/1

20/ 8.1

100/ 40.5

Tordon 101

20/ 76

Banvel 4WS

50/ 189

2,4-D Amine

100/ 379

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Spokane Area

Region No. 1

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.			

Kootenai National Forest
Cabinet District

Line Name

Noxon-Libby No. 1
From 7/1 to 12/2

11/ 4.4^{3/} Tordon 101 11/ 41.6

Fisher River District

Line Name

Noxon-Libby No. 1
From 12/2 to 70/3
Libby-Conkelley
From 1/1 to 26/4

17/ 6.9^{3/} Tordon 101 17/ 64.4
39/ 15.8^{3/} Tordon 101 39/ 147.6

Flathead National Forest
Hungry Horse District

Line Name

Hungry Horse-Columbia Falls
From 2/2 to 9/5
Hungry Horse-Conkelley
From 2/2 to 9/5

11.9/ 4.8^{1/} Ammate XNI 45/ 20.4
11.9/ 4.8^{1/} Ammate XNI 45/ 20.4

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
 BY NATIONAL FOREST AND DISTRICT
 Spokane Area

Region No. 1

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.			

Kaniksu National Forest
Newport District

Line Name

Bell-Boundary #2
 From 45/3 to 46/3

6/ 2.4¹/₂

Tordon 101

.2/ .1

Lolo National Forest
Superior District

Line Name

Dworshak-Hot Springs
 From 80/1 to 94/12

5.1/ 2.0¹/₂

Tordon 101

.1/ .3

St. Jo National Forest
Avery District

Line Name

Dworshak-Hot Springs
 From 32/1 to 35/1

4.1/ 1.6¹/₂

Tordon 101

.1/ .3

TABLE 5 (cont'd)
 BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
 BY NATIONAL FOREST AND DISTRICT
 Spokane Area
 Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide				
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.		gal./liter	lb/kg

Colville National Forest
Sullivan Lake District

Line Name

Bell-Boundary #1
 From 58/1 to 59/1

2/ .8¹/₂

Ammate XNI

10/ 4.5

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Walla Walla Area

Region No. 4

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.			

Targhee National Forest
Idaho Falls District

Line Name

Palisades-Goshen No. 1

From 11/5 to 28/2

8/ 3

5/ 2

Tordon 101

1/ 4

Swan Valley-Teton

From 3/7 to 13/1

8/ 3

4/ 2

Tordon 101

1/ 4

Targhee National Forest
Driggs District

Line Name

Swan Valley-Teton

From 13/1 to 29/1

2/ 1

2/ 1

Tordon 101

1/ 4

Bridger-Teton National Forest
Hoback District

Line Name

Swan Valley-Teton

From 29/1 to 34/8

4/ 2

2/ 1

Tordon 101

1/ 4

TABLE 5 (cont'd)
BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Walla Walla Area

Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.			

Deschutes National Forest
Fort Rock District

Line Name

Pilot Butte-Chiloquin
From 6/3 to 44/5

5/ 2

Deschutes National Forest
Crescent District

Line Name

Pilot Butte-Chiloquin
From 44/5 to 64/4

10/ 4

25/ 10

Tordon 101 10/ 38

Mt. Hood National Forest
Hood River District

Line Name

Bonneville-The Dalles
From 1/2 to 17/3
Big Eddy-Troutdale
From 20/1 to 39/3

20/ 8

25/ 10

Tordon 101 10/ 38

40/ 16

100/ 40

Tordon 101 60/ 227

TABLE 5 (cont'd)

BPA's FY 1981 RIGHT-OF-WAY MANAGEMENT PROGRAM
BY NATIONAL FOREST AND DISTRICT
Walla Walla Area

Region No. 6

Area of each Management Method			Herbicide	Application per line	
Hand Cutting	Herbicide			gal./liter	lb/kg
	Aerial	Selective			
acres/ha.	acres/ha.	acres/ha.			

Wallowa-Whitman National Forest
LaGrande District

Line Name

Roundup-LaGrande
From 30/10 to 36/1

5/ 2

Gifford Pinchot National Forest
Wind River District

Line Name

North Bonneville-Midway
From 15/5 to 18/3

2/ 1

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Portland Area

STATE OF OREGON

County	Station	Acres/Hectares	Herbicide	Gal./Liter per Station	Lbs./Kg per station
BENTON	Adair	.6/ .24	Pramitol 5PS		261/ 118
	Wren	.7/ .28	Pramitol 5PS		305/ 138
CLACKAMAS	Ostrander	18.0/7.28	Pramitol 5PS		7830/3552
	Pearl	18.5/7.49	Pramitol 5PS		13050/5919 *
COLUMBIA	Allston	23.0/9.31	Pramitol 5PS		10005/4538
DOUGLAS	Gardiner	1.0/ .40	Pramitol 5PS		435/ 197
	Hanna	1.5/ .61	Pramitol 5PS		653/ 296
	Lookingglass	1.0/ .40	Pramitol 5PS		435/ 197
	Reston	5.0/2.02	Pramitol 5PS		2175/ 987
HOOD RIVER	Cascade Locks	1.0/ .40	Pramitol 5PS		435/ 197
LANE	Blue River	1.0/ .40	Pramitol 5PS		435/ 197
	Dexter	.8/ .32	Pramitol 5PS		348/ 158
	Dorena	1.2/ .49	Pramitol 5PS		522/ 237
	Fern Ridge	1.6/ .65	Pramitol 5PS		696/ 316
	Florence	1.0/ .40	Pramitol 5PS		435/ 197
	Hills Creek	.1/ .04	Pramitol 5PS		44/ 20
	Lookout Point	1.3/ .51	Pramitol 5PS		566/ 257
	Mapleton	1.0/ .40	Pramitol 5PS		435/ 197
	Oakridge	1.0/ .40	Pramitol 5PS		435/ 197
	Rainbow Valley	.5/ .20	Pramitol 5PS		218/ 99
	Springfield	1.0/ .40	Pramitol 5PS		435/ 197
	Wendson	5.0/2.02	Pramitol 5PS		2175/ 987
LINCOLN	Burnt Woods	.5/ .20	Pramitol 5PS		218/ 99
LINN	Harrisburg	.5/ .20	Pramitol 5PS		218/ 99
MARION	Detroit	1.5/ .61	Pramitol 5PS		653/ 296
	Salem Alumina	1.0/ .40	Pramitol 5PS		435/ 197
	Tumble Creek	.5/ .20	Pramitol 5PS		218/ 99

* Includes initial application of 870 lbs./acre on 11.5 acres of new 230 KV sub site.

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Portland Area

STATE OF OREGON

<u>County</u>	<u>Station</u>	<u>Acres/Hectares</u>	<u>Herbicide</u>	<u>Gal./Liter per Station</u>	<u>Lbs./Kg per station</u>
POLK	Brush College	1.5/ .61	Pramitol 5PS		653/ 296
	Monmouth	.5/ .20	Pramitol 5PS		218/ 99
TILLAMOOK	Beaver	.5/ .20	Pramitol 5PS		218/ 99
	Garibaldi	.5/ .20	Pramitol 5PS		218/ 99
	Hebo	.5/ .20	Pramitol 5PS		218/ 99
	Mohler	.5/ .20	Pramitol 5PS		218/ 99
	Tillamook	3.0/1.21	Pramitol 5PS		1305/ 592
YAMHILL	Carlton	1.0/ .40	Pramitol 5PS		435/ 197
	McMinnville	3.0/1.21	Pramitol 5PS		1305/ 592
	Walnut City	1.0/ .40	Pramitol 5PS		435/ 197

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Portland Area

STATE OF WASHINGTON

<u>County</u>	<u>Station</u>	<u>Acres/Hectares</u>	<u>Herbicide</u>	<u>Gal./Liter per Station</u>	<u>Lbs./Kg per station</u>
CLARK	Camas	.5/ .20	Pramitol 5PS		218/ 99
	Mill Plain	1.0/ .40	Pramitol 5PS		435/ 197
SKAMANIA	Cape Horn	.5/ .20	Pramitol 5PS		218/ 99
	Carson	.5/ .20	Pramitol 5PS		218/ 99
	North Bonneville	7.0/2.83	Pramitol 5PS		3045/1381
	Stevenson	.5/ .20	Pramitol 5PS		218/ 99

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Seattle Area

STATE OF WASHINGTON

County	Station	Acres/Hectares	Herbicide	Gal./Liter per Station	Lbs./Kg per station
Clallam	Port Angeles	6.80/ 2.75	Ureabor		2700/1225
	Sappho	2.09/ .85	Ureabor		800/ 363
Grays Harbor	Aberdeen	4.2 / 1.70	Ureabor		1700/ 771
	Cosmopolis	2.6 / 1.05	Ureabor		1000/ 453
Jefferson	Duckabush	.61/ .25	Ureabor		200/ 91
	Fairmount	3.73/ 1.51	Ureabor		1500/ 680
King	Covington	29.75/12.05	Ureabor		11900/5398
	Maple Valley	13.94/ 5.65	Ureabor		5600/2268
	Raver	19.8 / 8.02	Ureabor		7900/3583
	Microwave Sta.	.5 / .20	Ureabor		200/ 91
Kitsap	Bremerton	.73/ .30	Ureabor		300/ 136
	Kitsap	5.65/ 2.29	Ureabor		2250/1020
Chahalalis	Centralia	.49/ .20	Ureabor		200/ 91
	Chehalis	9.30/ 3.77	Ureabor		3700/1678
	Morton	.27/ .11	Ureabor		100/ 45
	Paul	13.11/ 5.31	Ureabor		5200/2359
	Pe Ell	.67/ .27	Ureabor		250/ 113
	Silver Creek	2.75/ 1.11	Ureabor		1100/ 449
	Microwave Sta.	.20/ .08	Ureabor		50/ 23
Mason	Bayshore	.53/ .21	Ureabor		200/ 91
	Belfair	.65/ .26	Ureabor		250/ 113
	Kamilche	.50/ .20	Ureabor		200/ 91
	Mason	.26/ .10	Ureabor		100/ 45
	Potlatch	.88/ .36	Ureabor		350/ 159
	Shelton	2.90/ 1.17	Ureabor		1100/ 499

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Seattle Area

STATE OF WASHINGTON

County	Station	Acres/Hectares	Herbicide	Gal./Liter per Station	Lbs./Kg per station
Pacific	Holcomb	.57/ .23	Ureabor		200/ 91
	Long Beach	.73/ .30	Ureabor		300/ 136
	Naselle	1.84/ .75	Ureabor		700/ 317
	Raymond	1.89/ .76	Ureabor		750/ 340
	Willapa River	.60/ .24	Ureabor		250/ 113
Pierce	So. Tacoma Sub.	3.0 / 1.22	Ureabor		1200/ 544
	Tacoma	9.12/ 3.69	Ureabor		3650/1656
	Microwave Sta.	.50/ .20	Ureabor		200/ 91
San Juan	Lopez	.50/ .20	Ureabor		200/ 91
Skagit	Fidalgo	.57/ .23	Pramitol		150/ 68
Snohomish	Monroe	25.8 /10.45	Krovar		258/ 117
	Murray	2.6 / 1.05	Ureabor		1040/ 472
	Snohomish	17.15/ 6.96	Ureabor		6850/3107
	Snohomish	1.1 / .45	Krovar		11/ 5
	SnoKing	6.7 / 2.72	Pramitol		2700/1225
	Microwave	1.2 / .49	Ureabor		500/ 227
Thurston	Olympia	20.60/ 8.35	Ureabor		8250/3742
Wahkialum	Svenson	.23/ .09	Ureabor		100/ 45
Whatcom	Bellingham	4.5 / 1.82	Ureabor		1800/ 816
	Custer	16.06/ 6.50	Ureabor		6400/2903
	Intalco	10.00/ 4.05	Ureabor		4000/1814

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Spokane Area

STATE OF IDAHO

<u>County</u>	<u>Station</u>	<u>Acres/Hectares</u>	<u>Herbicide</u>	<u>Gal./Liter per Station</u>	<u>Lbs./Kg per station</u>
Bonner	Priest River	1.0/ .40	Pramitol 5 PS		145/ 66
	Samuels	.4/ .16	Pramitol 5 PS		58/ 26
	Sandpoint	.9/ .36	Pramitol 5 PS		131/ 59
Clearwater	Dworshak	10.0/4.05	Pramitol 5 PS		1450/ 658
Kootenai	Prairie	.5/ .20	Pramitol 5 PS		73/ 33
Nez Perce	Hatwai	17.0/6.88	Pramitol 5 PS		2465/1118
	Lewiston Complex	2.0/ .81	Pramitol 5 PS		290/ 132

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Spokane Area

STATE OF MONTANA

<u>County</u>	<u>Station</u>	<u>Acres/Hectares</u>	<u>Herbicide</u>	<u>Gal./Liter per Station</u>	<u>Lbs./Kg per station</u>
Deer Lodge	Anaconda	4.0/1.62	Pramitol 5 PS		580/263
Flathead	Conkelley	9.0/3.65	Pramitol 5 PS		1305/592
	Flathead	1.8/ .73	Pramitol 5 PS		261/118
	Kalispell	1.5/ .61	Pramitol 5 PS		218/ 99
Granite	Sherryl	1.3/ .53	Pramitol 5 PS		189/ 86
Lake	Elmo	.3/ .12	Pramitol 5 PS		44/ 20
Lincoln	Libby (Const.)	.4/ .16	Pramitol 5 PS		58/ 26
	Troy	.4/ .16	Pramitol 5 PS		58/ 26
	Yaak	.3/ .12	Pramitol 5 PS		44/ 20
Mineral	Tarkio	.3/ .12	Pramitol 5 PS		44/ 20
Silver Bow	Silver Bow	2.0/ .81	Pramitol 5 PS		290/132

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Spokane Area

STATE OF WASHINGTON

County	Station	Acres/Hectares	Herbicide	Gal./Liter per Station	Lbs./Kg per station
Adams	Hatton	.5 / .20	Pramitol 5 PS		73/ 33
	Ralston	.5 / .20	Pramitol 5 PS		100/ 45
	Ritzville	.5 / .20	Pramitol 5 PS		73/ 33
	Schrag	.5 / .20	Pramitol 5 PS		73/ 33
Chelan	Malaga M/W	.08/ .03	Pramitol 5 PS		12/ 5
	Valhalla	12.0 /4.86	Pramitol 5 PS		1740/ 789
Douglas	Chief Joseph	12.9 /5.22	Pramitol 5 PS		1871/ 849
	Columbia	12.2 /4.94	Pramitol 5 PS		1769/ 802
	Del Rio M/W	.15/ .06	Pramitol 5 PS		22/ 10
	Foster Creek	.3 / .12	Pramitol 5 PS		44/ 20
	Foster Creek M/W	.16/ .06	Pramitol 5 PS		23/ 11
	Grand Coulee M/W	.10/ .04	Pramitol 5 PS		15/ 7
	Orondo	.5 / .20	Pramitol 5 PS		73/ 33
	Rocky Reach	2.5 /1.01	Pramitol 5 PS		363/ 165
	Waterville M/W	.07/ .02	Pramitol 5 PS		10/ 5
Garfield	Lower Granite	7.0 /2.84	Pramitol 5 PS		1015/ 460
	Pomeroy	.7 / .28	Pramitol 5 PS		102/ 46
Grant	Beverly M/W	.07/ .02	Pramitol 5 PS		10/ 5
	Potholes	3.4 /1.38	Pramitol 5 PS		493/ 224
Kittitas	Easton M/W	.05/ .02	Pramitol 5 PS		7/ 3
	Kittitas M/W	.09/ .03	Pramitol 5 PS		13/ 6
	Teanaway M/W	.10/ .04	Pramitol 5 PS		15/ 7
Lincoln	Creston	.9 / .36	Pramitol 5 PS		131/ 59
	Odessa	.5 / .20	Pramitol 5 PS		73/ 33
	Plum M/W	.13/ .05	Pramitol 5 PS		19/ 9
	Wagner Lake	.4 / .16	Pramitol 5 PS		58/ 26
Okanogan	Tunk M/W	.05/ .02	Pramitol 5 PS		7/ 3

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Spokane Area

STATE OF WASHINGTON

<u>County</u>	<u>Station</u>	<u>Acres/Hectares</u>	<u>Herbicide</u>	<u>Gal./Liter per Station</u>	<u>Lbs./Kg per station</u>
Pend Oreille	Boundary	5.0 /2.03	Pramitol 5 PS		725/ 329
	Metaline Falls	.5 / .20	Pramitol 5 PS		73/ 33
	Sacheen	3.3 /1.34	Pramitol 5 PS		479/ 217
Spokane	Bell	17.0 /6.88	Pramitol 5 PS		2465/1118
	Bell Storage Yard	8.0 /3.24	Pramitol 5 PS		1160/ 526
	Four Lakes	1.9 / .77	Pramitol 5 PS		276/ 125
	Green Bluff	.3 / .12	Pramitol 5 PS		44/ 20
	Springhill	1.0 / .40	Pramitol 5 PS		145/ 66
	Valley Way	.8 / .32	Pramitol 5 PS		116/ 53
	Vera	.6 / .24	Pramitol 5 PS		87/ 40
Stevens	Addy	4.0 /1.62	Pramitol 5 PS		580/ 263
	Colville	3.2 /1.29	Pramitol 5 PS		464/ 210
Whitman	Chambers	.4 / .16	Pramitol 5 PS		58/ 26
	Clarkston	.4 / .16	Pramitol 5 PS		58/ 26
	Colfax	.7 / .28	Pramitol 5 PS		102/ 46
	Little Goose	10.0 /4.05	Pramitol 5 PS		1450/ 658
	Riparia	.3 / .12	Pramitol 5 PS		44/ 20

TAB 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Walla Walla Area

STATE OF IDAHO

<u>County</u>	<u>Station</u>	<u>Acres/Hectares</u>	<u>Herbicide</u>	<u>Gal./Liter per Station</u>	<u>Lbs./Kg per station</u>
Cassia	Albion	.1/.04	Ureabor		150/ 68
	Bridge	1.1/.44	Ureabor		1500/ 675
	Declo	.1/.04	Ureabor		150/ 68
Minidoka	Haymill	1.0/.4	Ureabor		1200/ 540
	Paul	.2/.08	Ureabor		200/ 90
	Rupert	.2/.08	Ureabor		200/ 90

TABLE 5 (cont'd)

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Walla Walla Area

STATE OF OREGON

County	Station	Acres/Hectares	Herbicide	Gal./Liter per Station	Lbs./Kg per station
Deschutes	Hampton	.5/ .2	Pramitol 25E	10/ 37.8	
	LaPine	1.5/ .6	Pramitol 25E	20/ 75.6	
	Redmond	8.0/3.2	Pramitol 5 PS		2000/ 900
	Sand Springs	3.0/1.2	Pramitol 25E	45/170.1	
Gilliam	Condon	.8/ .32	Aatrex 80W		6/ 3
Harney	Harney	2.0/ .8	Pramitol 25E	30/113.4	
Hood River	Hood River	5.0/2.0	Pramitol 5 PS		1000/ 450
	Parkdale	3.5/1.4	Pramitol 5 PS		750/ 338
	Woody Guthrie	.8/ .32	Pramitol 5 PS		200/ 90
Jefferson	Grizzly	15.0/6.0	Pramitol 5 PS		3650/1643
Klamath	Fort Rock	5.3/2.12	Pramitol 25E	80/302.4	
	Malin	22.0/8.8	Pramitol 5 PS		5500/2475
	Sycan	4.5/1.8	Pramitol 25E	68/257.0	
Sherman	DeMoss	1.2/ .48	Aatrex 80W		10/ 5
	John Day	18.0/7.2	Aatrex 80W		136/ 62
	John Day Access Road	2.5/1.0	Aatrex 80W		20/ 9
	John Day Dam Site	.4/ .16	Aatrex 80W		3/ 1
Umatilla	McNary	18.5/7.4	Pramitol 25E	185/6993	
	Roundup	4.0/1.6	Pramitol 25E	40/151.2	
Union	LaGrande	2.0/ .8	Pramitol 25E	20/ 75.6	
Wasco	Big Eddy	12.0/4.8	Pramitol 5 PS		2500/1125
	Big Eddy 500 kV	10.0/4.0	Telvar		200/ 90
	Celilo	15.0/6.0	Pramitol 5 PS		7500/3375
	Maupin	3.0/1.2	Pramitol 5 PS		750/ 338
Wheeler	Fossil	1.1/ .44	Aatrex 80W		9/ 4

FY 1981

STATION WEED CONTROL PROGRAM BY STATE, COUNTY, AND STATION
Walla Walla Area

STATE OF WASHINGTON

County	Station	Acres/Hectares	Herbicide	Gal./Liter per Station	Lbs./Kg per station
Benton	Ashe 230 kV	6.0 /2.4	Pramitol 5 PS		480/216
	Ashe 500 kV	14.0 /5.6	Pramitol 5 PS		1120/504
	Benton Sw.	1.4 / .56	Pramitol 25E	15/ 56.7	
	Highlands	.8 / .32	Pramitol 25E	15/ 56.7	
	Horse Heaven	2.5 /1.0	Pramitol 25E	25/ 94.5	
	Kennewick	.8 / .32	Pramitol 5 PS		150/ 68
	Kennewick	.11/ .044	Casaron G4		50/ 23
	Kennewick Microwave	.8 / .32	Pramitol 25E	5/ 18.9	
	Midway Substation	11.0 /4.4	Pramitol 5 PS		880/396
	Midway Community	.3 / .12	Dowpon		30/ 14
	Midway Community	4.0 /1.6	Casaron G4		400/180
	Midway Community	5.0 /2.0	Tordon 10K	5/ 18.9	
	Midway Community	4.0 /1.6	2,4-D	5/ 18.9	
	Prosser	.4 / .16	Pramitol 5 PS		100/ 45
	Prosser	.06/ .024	Casaron G4		50/ 23
	Richland Sw.	1.25/ .5	Pramitol 25E	10/ 37.8	
	Richland Sw.	.04/ .016	Casaron G4		50/ 23
	Stevens Drive	.11/ .044	Casaron G4		50/ 23
	Thayer Drive	.11/ .044	Casaron G4		50/ 23
Franklin	Eagle Lake	1.02/ .408	Pramitol 25E	5/ 18.9	
	Franklin	7.5 /3.0	Pramitol 25E	20/ 75.6	
	Mesa	.64/ .256	Pramitol 25E	10/ 37.8	
	Scooteney	1.0 / .4	Pramitol 25E	10/ 37.8	
Klickitat	Bingen	1.5 / .6	Pramitol 5 PS		300/135
	Gilmer	.8 / .32	Pramitol 5 PS		200/ 90
	Goldendale	1.1 / .44	Aatrex 80W		9/ 4
	Harvalum	5.4 /2.16	Aatrex 80W		40/ 18
	North John Day Caps	1.7 / .68	Pramitol 25E	30/113.4	
Skamania	Underwood	.8 / .32	Pramitol 5 PS		200/ 90
Yakima	Moxee	6.0 /2.4	Pramitol 5 PS		480/216
	White Swan	.4 / .16	Pramitol 25E	5/ 18.9	



AFFECTED ENVIRONMENT

III. AFFECTED ENVIRONMENT

The geographical region described in this chapter includes the States of Washington, Oregon, Idaho, and the portion of Montana west of the Continental Divide. As shown in Figure 4, the region may be divided according to environmental similarity into seven subregions; including the Puget Sound-Willamette Valley, the Columbia River Plateau, the Snake River Plateau, and the Great Plains, which are separated respectively by the Coast Range, the Cascades, and the Rocky Mountains.

A. PHYSICAL ENVIRONMENT

Numerous streams, many of which feed into the Snake and Columbia Rivers, offer abundant opportunities for transportation, irrigation, commercial fishing, recreation, and the production of electricity. Associated with these streams are floodplains. Floodplain values include water resource values (natural moderation of floods, water quality maintenance, and groundwater recharge), living resource values (fish, wildlife, and plant resources), cultural resource values (open space, natural beauty, scientific study, outdoor education, and recreation), and cultivated resource values (agriculture, aquaculture, and forestry). Numerous wetlands also occur within the region. Wetland values include water resource values (natural moderation of floods, water quality maintenance, and groundwater recharge), living resource values (fish, wildlife, and plant resources), cultural resource values (open space, natural beauty, scientific study, outdoor education, and recreation) and cultivated resource values (agriculture, aquaculture, and forestry).

Sedimentation is generally not a significant problem in the region.⁽⁶⁾ In some areas, however, it is considered severe enough to interfere with one or more beneficial uses of water.⁽⁷⁾ Of the 22 water basins in the region (as subdivided by the EPA), suspended solids affect 23 percent from point sources and 64 percent from nonpoint sources; toxics (heavy metals, nonmetal toxics, and pesticides) affect 18 percent from point sources and 32 percent from nonpoint sources. For comparison, of the 246 basins in the country, suspended solids affect 35 percent from point sources and 54 percent from nonpoint sources; toxics affect 44 percent from point sources and 45 percent from nonpoint sources.⁽⁸⁾

Most of the region has been designated by the EPA, in accordance with the Clean Air Act, as class III air quality areas; however, the region does contain some designated and proposed class I and II areas where air quality degradation is more restricted. Air quality problems in the region are mainly associated with the Seattle and Portland metropolitan areas where the predominant problem is carbon monoxide followed by oxidants and total suspended particulates.⁽⁹⁾

The region contains a profound diversity of plant and wildlife habitats. From alpine meadows to desert scrub to coastal estuaries diverse ecological niches provide habitat for thousands of individual

species. Several species in the region are proposed or classified under the Endangered Species Act as threatened or endangered. The remaining habitat of some of these species is considered critical to the conservation of the species.

Also located within the region is a portion of the Pacific waterfowl flyway. Many waterfowl breed in the Arctic then migrate in large flocks across the region to wintering grounds farther south. Wetlands along the route provide important rest and feed stops for these migratory waterfowl.

B. LAND USE AND OWNERSHIP

Half of the region is covered by forest. The climate in that part of the region west of the Cascade Range is particularly well suited to the growth of trees, and three-quarters of the land in that area is covered by forest, compared to less than one-third of the land east of the Cascades.

Range and agricultural land covers the next largest area in the region. Rangeland occupies substantial areas in the Snake River and Rocky Mountain subregions. Agricultural lands are located primarily on the Columbia River Plateau, along the Snake River, and in the Willamette Valley; some of this is classified as prime and unique farmland.

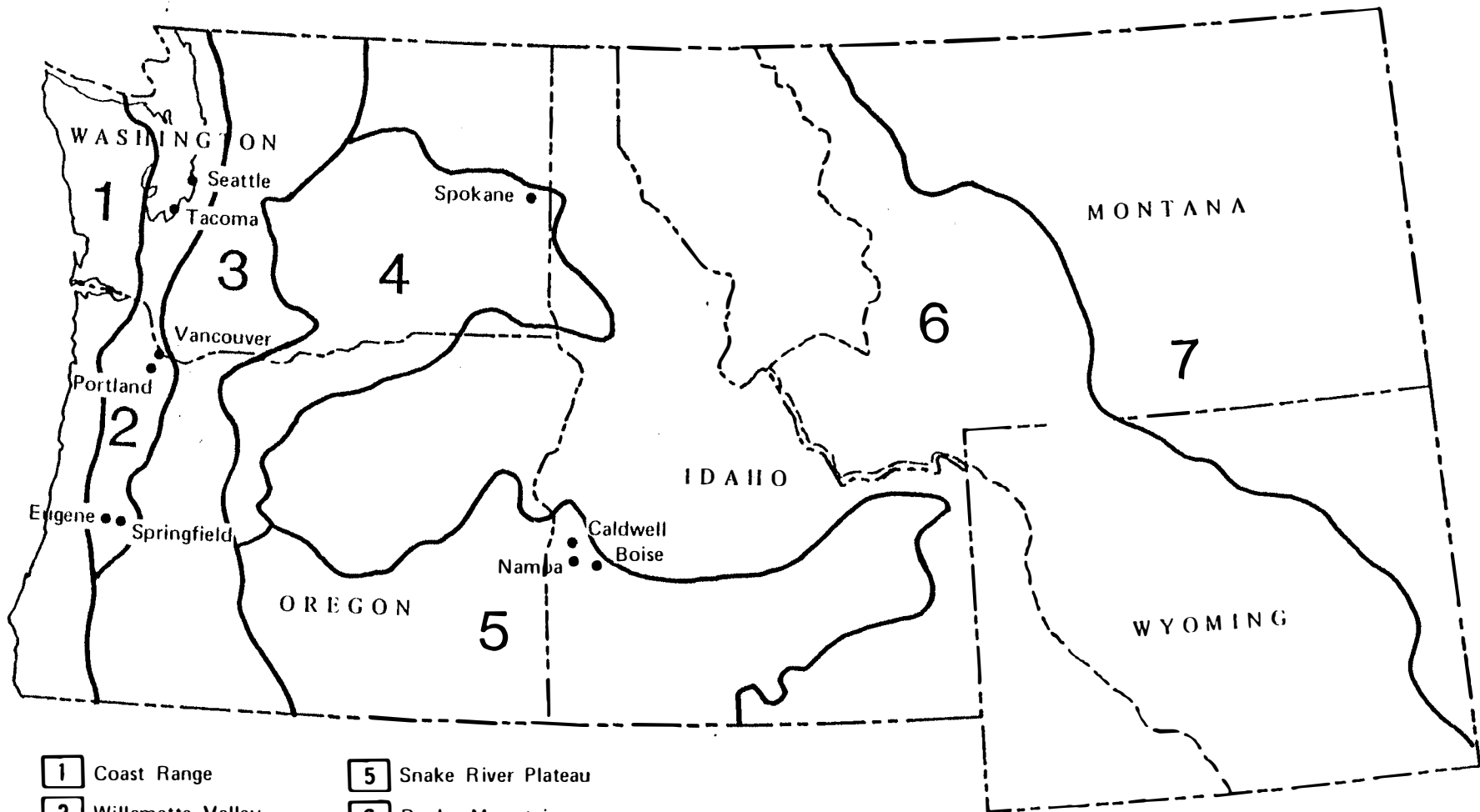
The major urban centers are Seattle-Tacoma, Portland-Vancouver, Eugene-Springfield, Spokane, and Boise-Nampa-Caldwell.

About two-thirds of the region is publicly owned and managed, enabling the development of effective land management programs and extensive recreational opportunities. The Federal Government owns half of the region's land, including about two-thirds of the land in western Montana and Idaho, one-half of the land in Oregon, and less than one-third of Washington. The U.S. Forest Service and Bureau of Land Management control most of the Federal land and manage much of the region's forest and rangeland. Smaller areas of Federal land are managed by Bureau of Indian Affairs, with 29 Indian reservations; the Bureau of Reclamation; and the National Park Service, including 6 national parks. State and local governments own about one-sixth of the land in the region, leaving one-third of the total area under private ownership.

C. THE REGIONAL ECONOMY

Of the total population of about 6-1/2 million, almost 2-1/2 million are employed. During the past two decades, population growth rates in the region have exceeded the national average, with Oregon and Washington experiencing more growth than the rest of the region. Because of the cyclical nature of the region's economy, unemployment rates have nearly always been higher in the region than in the Nation as a whole during the last 20 years. Within the region, Idaho has generally had the lowest rate of unemployment, while western Montana

FIGURE 4
SUBREGIONS
AND MAJOR CITIES



- | | |
|--------------------------|-----------------------|
| 1 Coast Range | 5 Snake River Plateau |
| 2 Willamette Valley | 6 Rocky Mountains |
| 3 Cascade Range | 7 Great Plains |
| 4 Columbia River Plateau | |



has had the highest, except during the early 1970s when the recession in Washington's aircraft industry resulted in high unemployment in that State.

About two-thirds of the region's labor force is employed in the areas of retail and wholesale trade, services, government, and transportation. The latter has been particularly important in the region's economy and includes a largely completed interstate highway system, coastal and inland water traffic, railroad lines from the regional centers to the major ports, and air transportation between the major cities.

One-fourth of the labor force in the region, but somewhat less in Idaho, is employed in manufacturing and construction. Throughout the region, two of the three largest manufacturing employers are the lumber and wood products industry and the food and kindred products industry. In addition to these two industries, the third largest manufacturing employer in Washington is the transportation equipment industry; in Oregon, the electrical equipment and supplies industry; and in Idaho, the chemicals and allied products industry. An important factor in the growth of some industries in the region, particularly chemicals and primary metals, has been the availability of inexpensive electricity.

The remainder of the labor force is employed in agriculture, forestry, commercial fishing, and mining. While the percentage of workers in agriculture is twice as high in Idaho as it is in the rest of the region, the State with the highest percentage of land in agriculture is Washington. Throughout the region, the construction of new irrigation facilities is bringing more land into production. Forestry and fishing occupy a much smaller percentage of the labor force than does agriculture. Commercial fishing takes place along the coast and on the Columbia River. Most of the timber harvest occurs west of the Cascades.

D. PATTERNS OF ELECTRICITY USE

The use of electricity within the region may be described according to differences in geographical location and time of the year. The subregion of Puget Sound-Willamette Valley, where two-thirds of the region's population lives, uses the greater portion of the electricity consumed in the region. Within this subregion, electrical energy requirements are highest during the winter when space heating needs are greatest. East of the Cascades, electrical energy requirements tend to be highest during the summer because of irrigation pumping and air conditioning loads.

The use of electricity within the region may also be described according to the type of user. Almost half of the electricity consumption is industrial, with electroprocess industries purchasing one-half of the total industrial consumption. The next largest users are the forest products industry, which uses one-fifth of the industrial consumption; crop irrigators, which use one-sixteenth; and the chemical industry, which uses almost one-twentieth. Residential users account

for nearly one-third of the region's consumption of electricity, and commercial users account for one-seventh. Because the region has very little indigenous gas or oil, but a large supply of inexpensive hydroelectricity, far more homes and businesses in this region rely on electricity for space heating than elsewhere in the country. Residential customers in the region use twice as much electricity at half the cost per kilowatthour as the national average, although total per capita consumption of energy for the region is equal to the national average.

E. EXISTING FACILITIES FOR THE GENERATION AND BULK TRANSMISSION OF ELECTRICITY

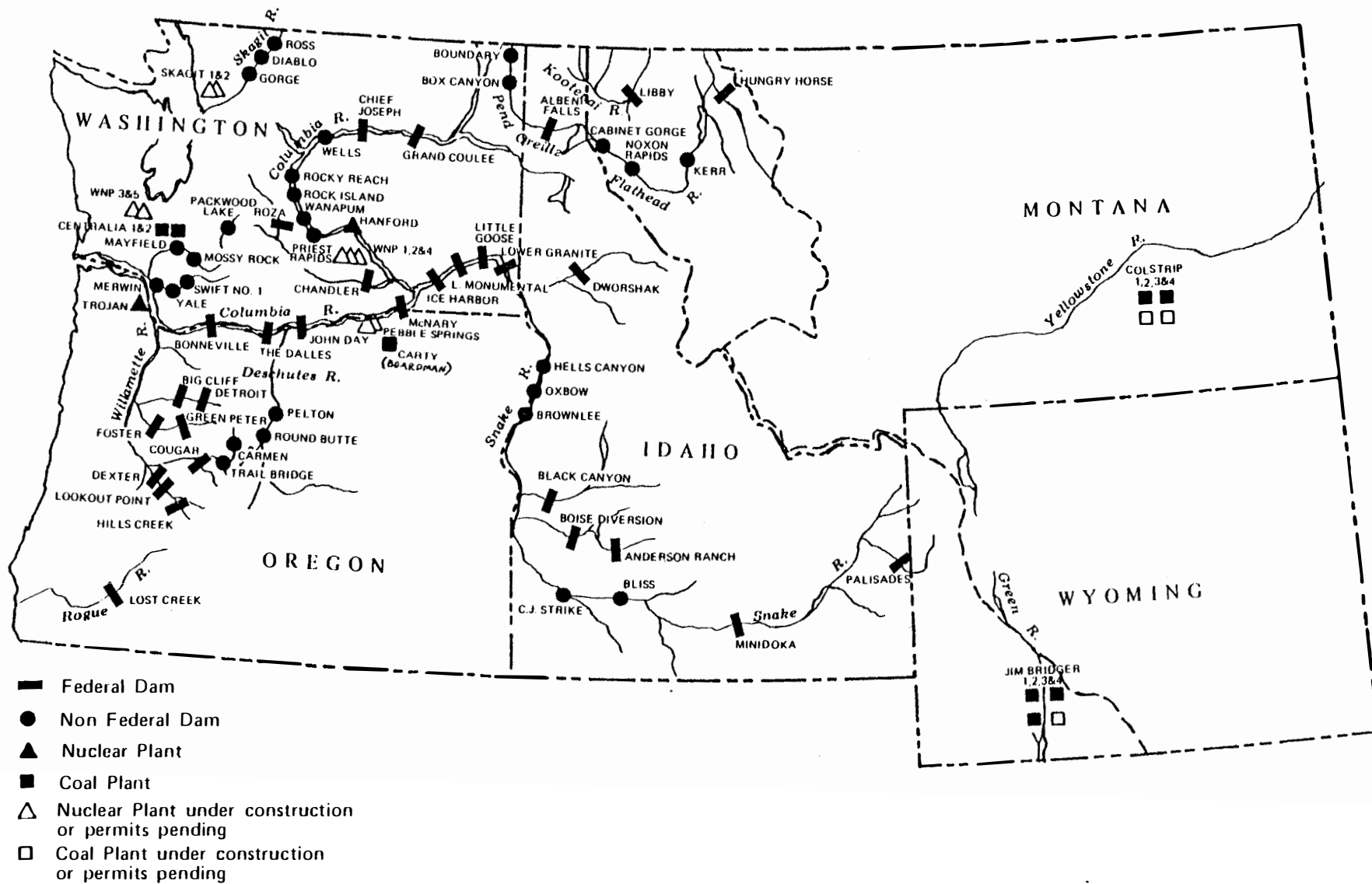
One-third of the Nation's hydroelectric potential lies within the region; the most desirable sites already have been developed. There are 58 major hydroelectric dams in the region as shown in Figure 5. The 30 Federally owned dams produce about half of the electricity consumed in the region. Electricity is also produced at two nuclear plants (one Federally owned, one non-Federal) and seven non-Federal coal plants. In addition, there are nine nuclear plants and four coal plants under construction or with permits pending.

Approximately 70 percent of the bulk high-voltage transmission system is owned and managed by BPA. The BPA system, shown in Figure 2, has links with transmission lines in two other regions, the Pacific Southwest and British Columbia, allowing for exchanges and sales of power.

F. SERVICE AREAS

Consumers of electricity in the region are served by both publicly owned and investor-owned utilities. Rural areas are typically served by publicly or cooperatively owned utilities, while other areas, with the exception of several metropolitan districts, are served by investor-owned utilities. Publicly owned utilities sell a greater proportion of electricity in Washington than in the rest of the region. Within the region, BPA provides direct service to 15 industries and 6 Federal agencies, and it wholesales firm power to 116 publicly or cooperatively owned utilities and nonfirm power to 8 investor-owned utilities.

FIGURE 5
MAJOR HYDROELECTRIC DAMS
AND THERMAL PLANTS





ENVIRONMENTAL CONSEQUENCES

IV. ENVIRONMENTAL CONSEQUENCES

A. CONSTRUCTION

In designing a plan of service to meet future system requirements, it is usually possible to parallel existing rights-of-way for at least a portion of the required distance. However, unless there already exists a route directly between the point of availability of generation and the load, a parallel route could result in a significantly longer line, requiring more total right-of-way with a resultant increase in adverse effects over a more direct route or line location. Otherwise, paralleling existing rights-of-way will result in general impacts similar to the construction of new lines, except that they will not occur in previously undisturbed areas.

Reliability criteria is another restriction limiting the implementation of paralleling. By grouping several transmission lines within a restricted area, the possibility of a simultaneous outage arising from a natural calamity such as a windstorm or snowslide, or from sabotage attempts, is greatly increased. Such an outage would result in a total loss of service to those areas where other sources of power might not be available.

Historically, BPA has adopted technological advancements in electrical transmission which increases the efficiency of its transmission system. Upgrading or replacing existing lower voltage transmission lines with lines of higher capacity minimizes additional rights-of-way that would otherwise be required. Although replacement would usually eliminate the need for any new right-of-way, there are constraints limiting the practical applicability of this method. In addition to technological constraints, the main limitation affecting the use of replacement is the need to remove existing lines from service to allow for rebuilding.

Research by BPA on 1200-kV transmission indicates that electricity may be transmitted at a much higher capacity than possible with 500-kV. This future technology could substantially reduce the amount of land dedicated to new rights-of-way. Ongoing research on UHV technology sponsored by BPA also includes investigations into short- and long-term biological and physical effects of electrostatic fields.

Transmission line load losses per unit of capacity are usually less with higher voltages. Load losses are greatest on overloaded lines. Thus, new or modified transmission facilities can often result in energy conservation by reducing system load losses.

1. Impact on Socioeconomic Resources and Land Use

The improvement and expansion of BPA's transmission facilities provide significant diverse social and economic benefits to the Pacific Northwest and to the entire nation through the resulting contribution to an abundant, reliable regional power supply. As a member of

the cooperative regional power program, BPA provides approximately 70 percent of the region's bulk power transmission capacity. The regional power program, which is based on close participation and coordination by Federal power-related agencies and the region's utilities, is designed to satisfy regional power requirements with the minimum investment of resources and the minimum impact on the environment.

The most important single benefit of an adequate, reliable regional power supply is its contribution to a relatively high regional standard of living. Generally speaking, there is a strong positive correlation between per capita energy consumption and per capita income. However, factors other than energy consumption can also be important determinants of per capita income. Because of the Pacific Northwest's greater dependency upon electricity relative to other regions of the country, an adequate supply of electricity is important to various economic sectors which provide employment as well as goods and services for the region's inhabitants.

In order to investigate into the relationships between energy use and economic development, BPA commissioned the services of Ernst and Ernst. The objective of the study undertaken was to provide a theoretical and quantitative description of the relationships between energy, electricity, employment, and output for specified industry groups. In addition, the study focused on electricity use in the aluminum industry because of its importance as a Pacific Northwest electricity consumer. The study indicated that, on a broad geographical scale, energy use and economic development moved together closely, but as the geographical area studied became smaller, energy and economic growth lost correlation. The study of specific industries discovered that relatively few types could be attracted to a region because of the price and/or availability of electricity.⁽¹⁰⁾

Therefore, while the availability and reliability of the power supply does not itself cause residential, commercial, or industrial development, or the resulting economic growth and population concentration, the lack of electric energy may inhibit these activities. In other words, the role of electricity can be considered permissive in that it allows growth to occur if conditions are otherwise favorable, and limiting in that it imposes a relative ceiling on the level of economic activity which can be conducted. Therefore, depending on a variety of factors other than the availability of reliable electric energy, construction of transmission facilities may eventually be accompanied by various kinds of development and growth. New commercial and industrial construction may occur which will have direct impacts on the environment. This may in turn lead to undesirable impacts on land use, increased solid waste production, increased liquid waste and sewage disposal problems, increased air pollution, and increases in local traffic associated with population concentration in areas of new or improved electric service where industrial or commercial development occurs. In some locations, population concentration and expanded public services could ultimately lead to recreational development in previously undeveloped areas, with attendant environmental impacts.

For individual actions included in the Fiscal Year 1981 Proposed Program, BPA will determine the proposed action's compatibility with State and local land use plans through consultation with appropriate State and local land use planning agencies. At this time, potential conflicts exist with the LaGrande-McNary project (SA 81-2) and the land use plans of LaGrande, Umatilla, and Hermiston, Oregon. State and local agencies are being contacted regarding the compatibility of the various facilities included in the Fiscal Year 1981 Proposed Program. The possibility of conflicts with land use plans will be examined in more detail when alternative locations have been identified. The results of these evaluations will be included in the appropriate site-specific environmental impact statement or environmental assessment.

For proposed individual actions located within or affecting coastal zones (in Washington, generally 200 feet inland from mean high tide to 3 nautical miles seaward; in Oregon, generally the Coast Range crest to 3 nautical miles seaward of mean high tide), State and local land use planning agencies and other agencies with jurisdiction will be consulted to determine the proposal's consistency with coastal zone management programs. BPA will endeavor to be consistent with land use plans and coastal zone management programs to the maximum extent practicable. These consistency determinations will be included in the appropriate site-specific environmental impact statement or environmental assessment.

For proposed individual actions on lands within the public domain, BPA will consult the land management agency with jurisdiction to determine land use policies and potential environmental impact on those lands.

The transmission lines, substation, and access roads included in the proposed program will have direct impact on the use of the land they occupy and, to a lesser extent, on adjacent lands. The nature and scope of this impact depends upon the type of facility and the existing and potential uses of the land involved. Many land uses are compatible with transmission corridors; BPA expects and encourages continued multiple use of the rights-of-way.

The 6 new substations included in the proposed program will occupy approximately 39 to 41 acres (15.6 to 16.4 ha) of land. Preliminary planning information indicates that one substation would be located in a mixed urban/agricultural area, one in a nonirrigated agricultural area, and two in mixed forest/range areas. Another substation may be expanded up to one acre (.4 ha) into a young Christmas tree farm. Since substation sites represent a single-purpose or dominant use, these lands will be removed from their existing use for the life of the facilities. In addition, some substations, by nature of their location, may serve as a focal point for future transmission lines and, as such, represent a potential impact greater than that resulting from the substation itself. Other impacts to land uses are described below.

a. Urban and residential

The presence of transmission lines or substations in urban and residential areas could have an impact upon the suitability of adjacent land for future land uses. Adjustments may have to be made in plot layout patterns and residential lot sizes to reflect the presence of the new facilities. Transmission lines included in the FY 1981 Proposed Construction Program would cross approximately 5-14 linear miles (8-22 kilometers) of urban or residential land, requiring approximately 90-270 acres (36-110 ha) of right-of-way.

On the basis of preliminary planning data no residences or buildings will need to be removed as a result of the Fiscal Year 1981 Program. Should it later be determined that removal of existing residences is required, procedures specified in the Uniform Relocation and Assistance and Land Acquisitions Policies Act of 1970 will be followed.

Impacts resulting from the line construction activities themselves will affect the local communities surrounding the construction site, because the specialized construction methods used usually makes it necessary for contractors to bring in a labor force from outside the area. The extent of these impacts to the community are determined by the type and size of the construction project and the size of the existing community. For example, if we examine the construction schedule for two hypothetical transmission lines, a 10-mile (16 km) segment of a small capacity 115-kV line and a 100-mile (161 km) section of a high capacity 500-kV line, we find that the former construction time may be as little as 4-1/2 months with a maximum work force of about 20 workers; whereas with the larger project, construction may take as long as 20 months, requiring a peak work force of as many as 170 workers. It can be expected that impact to the surrounding community resulting from construction of the smaller line would be minor and of a short duration. Similar impacts involving the need for housing of the construction workers, increases in road traffic and noise levels, etc., would occur during the construction period for the larger project, but these impacts could potentially affect a larger number of communities for a longer period of time. Similarly, with the construction of a substation, impacts to adjacent communities would also vary depending upon the construction work force involved, which could be from 12 to 30, depending upon size and the duration of the construction period. The construction period could vary from less than 2 months to almost 8 months.

Residences immediately adjacent to the construction activity would be temporarily subject to dust and noise from the operation of heavy equipment. Also, these residences may be permanently affected by radio, television, and audible noise interference as discussed in Section IV.A.2.a.(2) below.

b. Agriculture

New transmission lines for the FY 1981 Proposed Program would cross approximately 39-57 linear miles (62-91 km) of cropland, and new right-of-way easements would total approximately 904-1,016 acres (362-406 ha) of cropland. However, only the areas occupied by new tower footings, a total of approximately 7.1-10.4 acres (2.8-4.2 ha), would be permanently removed from agricultural production. Two new substations located in cropland would remove up to 15 acres (6 ha) from production.

The amount of land lost from production around transmission towers would be greater for irrigated land than for nonirrigated land with the resulting loss in revenue proportionally more significant.⁽¹¹⁾ Normally, when lines traverse existing irrigated farmland, tower sites are chosen which minimize conflicts with the existing irrigation system(s). In some instances, realignment of the irrigation pattern may be required to obtain maximum use of the remainder of the field. However, possible changes in the irrigation pattern may be limited by existing towers in adjacent land. Towers are not usually located within fields being irrigated by circular sprinkler systems.

Also, yields in the immediate vicinity of transmission towers may be reduced because of overfertilization, overlapping coverage of weed control chemicals, overworking of soil, seed loss, and harvest losses. The extent of any adverse effects adjacent to towers will depend upon the type of crop grown and the farming practices followed, as well as the kind of equipment used for cultivating, planting, irrigation, pest and disease control, and harvesting.

The area between transmission line towers would be generally compatible with crop production. However, where towers or poles are in the path of cultivation, some inconvenience and additional operator time may result, especially where large equipment is utilized. As a result, operators might choose not to bring new land on the right-of-way under cultivation, although experience indicates that land presently under cultivation will continue to be farmed.

The above effects on agricultural land use are long-term. There will also be some unavoidable short term effects as a result of construction access, tower assembly, erection, and stringing of the conductor. Where the tower erection area is on cultivated land, loss of production from staging areas and access roads will result if construction is carried on during the crop season. However, construction can usually be completed in one growing season or scheduled around it. A small reduction in crop yield in the years following construction may result from the temporary effects of soil compaction and disturbance. Because access is usually available along the right-of-way in cropland, permanent access roads in these areas are not normally established. Besides the acreage indicated above, temporary effects would also be incurred on an additional 73 linear miles (117 km) of agricultural lands from activities upgrading existing transmission lines, but no additional acreage removed from production.

BPA compensates landowners on an individual basis for the land occupied by the tower sites, for the right-of-way easement, and for any crop damage that occurs. Actual compensation depends upon the extent and duration of any damage and the type of crop under cultivation.

BPA will endeavor to avoid impacts to farmlands classified as prime and unique* by the U.S. Department of Agriculture. Determinations will be made whether individual actions included in the FY 1981 Proposed Program will adversely affect these lands and be included in the appropriate site-specific environmental impact statement or environmental assessment. If a proposed action is located within or determined to have an impact upon the continued use and viability of such farmlands, all alternatives and mitigating measures will be considered and consultation initiated with the appropriate State Soil Conservation service office and USDA State Land Use Committee. BPA will not convert prime or unique farmlands to other uses unless other national interests over-ride the importance of preservation or otherwise outweigh the environmental benefits derived from their protection. Preliminary planning information indicates that some prime and unique farmland may be affected by both the Allston-Portland (S.A. 81-1) and LaGrande-McNary (S.A. 81-2) proposals.

c. Grazing

Approximately 192 linear miles (307 km) of rangeland would be crossed by new facilities included in the Fiscal Year 1981 Proposals, depending on final location. Since only that land actually occupied by the tower footings will be removed from production, a total of 35 acres (14 ha) of rangeland would be permanently affected by the proposed program. The remainder of the right-of-way would generally be compatible with range activities, although some clearing of brush and trees may be necessary to provide access for the heavy construction equipment. Some soil erosion may occur, as discussed in Section IV.A.2.d. New easements on rangeland would total approximately 3,120-3,140 acres (1,248-1,256 ha). An additional 7 linear miles (11 km) would be temporarily affected by reconductoring activities, but no additional acreage removed from production. Since access roads on rangeland are temporary and are generally seeded or allowed to grow over with natural vegetation after construction, no additional grazing land would be permanently removed from production by these roads. Three new substations may remove approximately 19-21 acres (7.6-8.4 ha) from grazing use.

* Prime farmlands are those whose value derives from their general advantage as cropland due to soil and water conditions. Unique farmlands are those whose value derives from their particular advantages for growing speciality crops.

d. Silviculture

The Fiscal Year 1981 proposals will require approximately 97-120 linear miles (155-192 km) of upgraded, new, and parallel transmission line construction through existing forest land, involving approximately 1,512-2,012 acres (605-805 ha) of right-of-way. Except where the lines span canyons or other areas where vegetation cannot grow tall enough to interfere with the lines overhead, tall-growing trees and brush are removed from the right-of-way to allow for construction, operation, and maintenance of the new transmission facilities. Commercially valuable timber is removed and sold, in some cases before the timber has reached maturity. Any stable tree outside of the immediate right-of-way which does not come closer than the minimum safe working distance from the outside conductor when displaced to its maximum design swing is allowed to remain. Unstable trees which, when falling, would strike the outside conductor when in a static condition are removed. Unstable trees include decayed, insect-infested, leaners, and burn-damaged trees. Because much of the new transmission line to be constructed in forested areas would be parallel to existing lines and entirely upon existing easements, the facilities associated with the Fiscal Year 1981 Proposed Program would require the clearing of up to approximately 1,112-1,572 acres (445-629 ha) of forest.

Where existing access roads in forested areas cannot be used for construction and maintenance, temporary and permanent access roads are built, thereby imposing an additional impact. These roads, which are normally about 14 feet wide, can usually be located within the cleared right-of-way. However, additional access roads are sometimes necessary from the right-of-way to the nearest existing commercial roads to allow access around steep slopes and other natural obstructions on the right-of-way. Although, as previously mentioned, a precise figure cannot be given at this time, it is expected that the total acreage requirements for permanent access roads through forest land would be approximately 51-72 acres (20-29 ha).

After construction is complete, the right-of-way is maintained to prevent regrowth of tall-growing vegetation for the life of the new facility. In addition, timber immediately adjacent to the cleared rights-of-way may also be adversely affected in that it will be subject to an increased chance of wind throw and sun scald.

Generally, cleared right-of-way on forest land is permanently removed from timber production, thereby reducing the total acreage available for sustained yield methods of forestry. However, the production of merchantable timber may continue in some situations. Also, Christmas tree farming is often compatible with right-of-way maintenance. Included among the FY 1981 new start items is the expansion of a substation which may remove from production up to 1 acre (.4 ha) of a Christmas tree farm.

The clearing of 1,163-1,644 acres (465-658 ha) of forest land would create short term work in the forest industries for

approximately 88 people. However, because of the annual growth loss during the life of the facilities, approximately 6-7 annual jobs in the forest industry and 12-14 service jobs would be lost. (These figures are based on data available from the Oregon Forest Industries Council and the U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station.)

e. Recreation

Because of the variety and abundance of recreational resources that exist in the Pacific Northwest, it is inevitable that some of the new facilities proposed in Fiscal Year 1981 will pass near existing recreational areas. Some of the new proposals will also pass through locations identified as having potential recreation use. In either situation, transmission lines can be expected to have an adverse visual impact upon the natural scenic character of the area. Since aesthetic character is frequently a factor contributing to an area's importance as a recreational resource, any visual impact could potentially affect its recreational value.

Even though the actual impact of the proposed new facilities on recreational resources will ultimately depend upon the final transmission line location or crossing, it can be assumed that the transmission lines, tower structures, and associated clearings would be visible to people using these resources. Depending upon the degree to which structures will intrude upon the scenic attributes of these areas and the individual expectations of people using them, the quality of the recreational experience otherwise available would be reduced.

Transmission line rights-of-way and their associated access roads are often used for various types of recreational activities such as bicycle trails, horse trails, snowmobile routes, and off-road vehicle access. Since transmission line rights-of-way are held in easement by BPA, rather than fee-ownership, recreational use depends upon the landowner or land management agency with jurisdiction by law.

Use of transmission line rights-of-way by snowmobiles and off-road vehicles has often resulted in detrimental effects, including increased erosion, wildlife disturbance, vandalism, increased fire hazards, and streambed disturbance. BPA will cooperate with landowners and land management agencies in preventing unauthorized use of rights-of-way and access roads by installing gates and locks. BPA will also cooperate with Federal land management agencies whenever the latter determines that the use of off-road vehicles in particular areas must be controlled or prohibited in order to prevent additional adverse effects.

The United States Forest Service (USFS) and the President have recently completed their Roadless Area Review and Evaluation (RARE II) recommendations. Actual adoption of wilderness area recommendations awaits congressional action. It is BPA's policy to avoid proposed as well as designated wilderness areas when planning for and locating transmission facilities.

BPA will endeavor to avoid adversely affecting any actual or proposed component of the National Trails System. For each project in the FY 1981 Proposed Program, BPA will determine whether the proposal will impact these trails and include that determination in the appropriate site-specific environmental impact statement or environmental assessment. Impacts to the immediate surrounding environment as well as the trails themselves will be considered, with emphasis on possible effects to the nature of the trails and the purposes for which these trails were established. If the proposed action would involve potential impacts to these trails, the appropriate land management agency with jurisdiction will be consulted. No impacts to these trails by the proposed program have been identified at this time.

f. Scenery

Substations, transmission lines, and associated access roads that are part of the Fiscal Year 1981 Proposed Program represent potentially discordant features that would have an adverse impact on the natural beauty and harmony of the scenic areas they traverse. A few of the facility proposals could affect certain scenic resources that exist within their respective study areas. In such situations visual impacts result from the clearing of right-of-way which, in addition to disrupting the existing vegetative pattern, can result in undesirable visual effects such as "skylining," where transmission towers are set in relief, making them visible for long distances. Local scenic resources will be affected to varying degrees depending upon site location and any mitigation measures that would normally be employed as part of the facilities' design.

g. Historic, archaeological, natural landmarks

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 USC 470 et seq), Executive Order 11593, and the Advisory Council on Historic Preservation's Regulations at 36 CFR Part 800, BPA will not undertake any action until it has determined the effect of the action upon sites or properties included on, nominated to, or eligible for inclusion in the National Register of Historic Places. An examination of the National Register of Historic Places, as well as subsequently issued monthly addenda, indicates that one of the alternative plans for Allston-Portland Area Service could possibly have some visual impact upon the Parkersville National Register Site south of Camas, Washington. At this time, no other sites listed in, nominated to, or eligible for inclusion in the National Register would be affected by the various facilities included in the Fiscal Year 1981 Proposed Program.

In addition to examining the National Register and contacting State Historic Preservation Officers, BPA is soliciting comments from local and regional historical and archaeological authorities relative to the completeness and accuracy of BPA's analysis of impacts to cultural resources attributable to the various components of the FY 1981 Proposed Program. For projects not covered in site-specific EISs,

this evaluation will be included in an environmental assessment or issued separately as appropriate.

Comments and information obtained as a result of these consultations will be included in the final facility planning phase EIS, environmental assessment (EA), or other appropriate document. Of course, the extent to which any cultural resource could be impacted depends upon final line or facility locations which have not yet been determined. If, during the location and design phase, it appears that a historical or archaeological site listed in or eligible for nomination to the National Register could be affected by any of the Fiscal Year 1981 proposals, BPA will comply with the Advisory Council's Regulations at 36 CFR Part 800, the National Historic Preservation Act of 1966, as well as the requirements of Executive Order 11593, as outlined below:

(1) The Historic Preservation Act of 1966

In compliance with those regulations issued by the Advisory Council on Historic Preservation (36 CFR Part 800) BPA has:

(a) Identified all known cultural resources listed in the National Register of Historic Places and agenda through August 1980 as they pertain to the planning study areas for the Fiscal Year 1981 Proposed Program. All such sites, either listed in the National Register or nominated as eligible for inclusion, have been identified in the planning evaluation.

(b) The Fiscal Year 1981 Program Statement, including planning phase EISs and EAs, are being circulated to the appropriate State Historic Preservation Officers for the various States in the BPA service area. These individuals are being asked to review and comment on the statement's or EA's completeness and to provide us with any additional information on possible impacts to historical, architectural, or archaeological sites of national significance that may result from the construction of these new facilities. Similar consultation is being solicited from local and regional historical and archaeological organizations which have been identified in the individual planning phase EISs and EAs.

(2) Further investigations will occur as facilities included in the Fiscal Year 1981 Proposed Program reach the facility location phase. Measures that will be employed by BPA at the facility location phase include:

(a) Continued consultation with local, State, and regional historical and archaeological authorities.

(b) State Historic Preservation Officers will be provided copies of the documentation of any location phase evaluations (EISs, EAs) for their review and comment. By so doing they will be able to examine and comment on the consequences of the various alternative facility locations, and to suggest other known or potential sites

within the study areas which might be eligible for nomination to the National Register.

(c) Where sites believed to be eligible for inclusion in the National Register are identified within the study areas, documentation regarding such sites will be forwarded to the Heritage Conservation and Recreation Service (HCRS) for a determination of eligibility.

(3) Executive Order 11593

In compliance with Executive Order 11593 of May 13, 1971 (36 FR 8921 et seq.), BPA will:

(a) Systematically survey all lands affected by the proposed facility site or route location as it appears in a final facility location phase EIS or in the EA, in order to locate and inventory all cultural sites not previously identified.

(b) For all sites identified as a result of the survey, and which would be affected by its proposed facility, BPA will apply the criteria of the HCRS to determine if they are significant enough for inclusion in the National Register.

(c) Information regarding any such potential sites, the significance of which is questionable, will be forwarded to the HCRS for a formal determination of eligibility.

(d) If any site is determined eligible for inclusion in the National Register, mitigative measures will be taken in consultation with the Advisory Council and State Historic Preservation Officer.

(e) During the interim period and until inventories and evaluations required by Executive Order 11593 are completed, BPA will exercise caution so as to not inadvertently transfer, sell, demolish, or substantially alter questionable sites. If questionably sensitive cultural sites are located, work crews are instructed by contract to notify their contracting officers and to suspend operations in the vicinity of such a site until told to proceed. All potentially significant sites will be referred to the HCRS for a determination regarding the property's eligibility for inclusion in the National Register. If appropriate, BPA will enter into discussions with the Council to discuss mitigating measures for any nationally significant property affected by the proposal.

h. Risk of accidents and health effects

(1) Electrical hazards

Transmission line failures because of an energized conductor falling to the ground can occur as the result of material failure or intentional vandalism, such as rifle fire, or as the

result of natural calamities such as severe storms and landslides. In either case, when a line drops to the ground, it is usually switched off in less than 1/2 second. For this duration, a voltage would appear in the vicinity of the tower involved, resulting in a localized hazard.

All electric transmission lines, including approximately 303-326 miles (485-522 km) of new overhead transmission line proposed for Fiscal Year 1981, pose an inherent hazard if objects such as irrigation pipe or construction booms are brought in contact with the conductor. Because conductor height from the ground, governed by the National Electric Safety Code, increases with voltage, the probability of such accidents is much smaller with the higher voltage lines of the type built by BPA. However, construction of any transmission line across agricultural land does create a hazard, and farm operators must observe basic precautions in their activities underneath and immediately adjacent to the lines. In an effort to minimize the possibility of accidents, BPA has published a brochure entitled Tips on How to Behave Near High-Voltage Power Lines.⁽¹²⁾ As is demonstrated by the frequent occurrence of farming under existing BPA lines, these rules should pose no additional hindrance to use of agricultural land occupied by the new facilities constructed as part of the Fiscal Year 1981 Program.

(2) Electrostatic and electromagnetic field effects

The electrostatic and electromagnetic fields associated with the high-voltage lines proposed as part of the Fiscal Year 1981 Program could induce voltage and currents in metallic structures and equipment near the line. The magnitude of an induced voltage and associated ground-discharge current from an electrostatic field depends upon the line voltage, the size of the object being charged, and the object's distance from the line conductors. The magnitude of induced current due to the electromagnetic field depends upon the load current in the conductors, the orientation and length of the object, and its distance from the conductors. Procedures for grounding metal structures and equipment along with other precautions used by BPA substantially eliminate the potential hazard and nuisance associated with this phenomenon.

In recent years there has been increasing public concern regarding possible adverse health effects from exposure to electrostatic and electromagnetic fields surrounding transmission lines. BPA, as well as other public and private utilities, feels that there is a need for additional research in the area of field effects. A great deal of research is currently underway. Through its own efforts, and through participation in various technical societies and the Electric Power Research Institute (EPRI), BPA has been keeping informed on the most recent findings in this area. BPA has summarized much of the currently available findings regarding the effects of both short term and long-term exposure to electric and magnetic fields of the type experienced under and around transmission lines. This summary can be found in Chapter VII-C. of Appendix B of the Role EIS. More recently, BPA has

prepared a publication entitled Electrical and Biological Effects of Transmission Lines: A Review. This document expands upon and updates much of the information contained in Appendix B; copies are available upon request.

BPA has had extensive experience with constructing, operating, and maintaining high-voltage transmission lines. Other than nuisance shocks from induced voltages, BPA is not aware of any conclusive evidence or research findings indicating that exposure to electrostatic and electromagnetic fields near operating transmission lines results in any harmful effects to humans, animals, or plants.

2. Impact on Natural Resources

The general impact of the proposed new facilities and maintenance activities on natural resources of regional or national significance is summarized below.

a. Atmosphere

(1) Air quality

The Fiscal Year 1981 Proposed Program would involve clearing activities on some forest lands. Unmerchantable trees and brush cleared from this acreage during construction operations will be disposed of. Historically, open burning has been regarded as the standard method of disposal for this type of debris. Where permissible by local regulations and State and Federal law, BPA will allow contractors to continue to use open burning during the construction of those facilities included in the Fiscal Year 1981 Program. This burning will result in some adverse air quality impacts from the combustion byproducts. Open burning of vegetation introduces combustion byproducts including water vapor, particulates, hydrocarbons, carbon monoxide, and carbon dioxide into the atmosphere. Relatively high concentrations of these byproducts near fire sites decreases rapidly in all directions, but can have cumulative effects in urban areas. Most of the impacts from burning are short term, and virtually all of the impacts on the atmosphere stop when the impact activity ceases because the atmosphere has the ability to regenerate or cleanse itself. However, the slash burning will slightly contribute to the global increase of atmospheric carbon dioxide content caused by the increased use of fossil fuels in this century. BPA requires contractors to construct slash piles in such manner as will reduce smoke to the minimum amount practicable.

With increasing frequency, county and State air pollution control regulations are requiring improved slash disposal methods, such as forced-air burning which, although effective in reducing particulate emissions, involves considerable expense. In disposing of slash and unmerchantable timber cleared from forested land during Fiscal Year 1981, BPA's contractors will consult with the State and local authorities regarding permissible techniques and will follow all applicable regulations governing burning methods and times permissible.

Contractor burning operations are supervised by BPA to assure compliance. Because of the cost of alternative methods of disposal, and some environmental trade-offs, natural draft open burning remains the primary disposal method and is used where local air pollution regulations permit. However, where proximity to population centers, or when conditions including winds, dryness of vegetation, atmospheric inversions, and temperature preclude open burning, alternative methods of slash disposal are utilized. The two techniques most frequently proposed as alternatives to natural-draft open burning are chipping and controlled or forced air burning.

The use of chipping as an alternative to open burning would eliminate the introduction of particulates and other combustion byproducts into the atmosphere. Since chipping requires the operation of large equipment, a substantial amount of road would have to be built or provide access for the machinery. Operation of these chipping machines would also require fossil fuels which, in addition to being both expensive and currently in short supply, would also add characteristic pollutants associated with internal combustion engines. In addition to being a very slow process, chipping can be three to four times as costly as burning.

The overall environmental impact of burying or scattering chips has not yet been fully determined, although there appears to be some adverse environmental effects associated with the trenching necessary for burying chips, and nitrogen depletion of soils may present a problem if chips are scattered.

A variety of controlled burning techniques are currently available which offer the advantage of incineration at higher temperatures than that obtainable with natural draft open burning. The Camran burner is one device which promotes a hotter burn. Higher temperatures provide for better combustion with resultant decrease in air emissions. Combustion emissions are reduced by up to 80 percent utilizing this method, provided the unit operates at peak efficiency.⁽¹³⁾ However, observations by BPA and Oregon State Department of Environmental Quality staff indicate operational problems with the unit, including achieving optimum combustion temperature. In addition to operational problems, the method is significantly slower and more expensive than open burning. Extensive access roads are also required for the Camran burner, as its design limits it to surfaced or high grade roads with wide radius curves for transport.

Pit burning methods have also been advocated and can be expected to bring corresponding reduction in particulate emissions but with some local soil disturbance associated with trenching operations.

In some cases, slash is left in piles as cover for wildlife. This practice is limited, however, because of fire hazard.

As in the past, BPA contractors will consult with local air pollution control authorities and, when required will utilize recommended disposal methods for slash associated with the Fiscal Year 1981 construction program.

During dry summer months, dust caused by traffic on dirt access roads can temporarily degrade local air quality. Construction vehicles may also contribute to local air pollution with engine exhausts.

(2) Noise

Operation of high-voltage transmission lines, particularly those above 345-kV, results in some radio, television, and audible noise interference immediately adjacent to the right-of-way. The audible noise level from the operation of a 500-kV line incorporating BPA's new triple-bundle conductors measured at the edge of the right-of-way averages 47 decibels (equivalent to the noise of light highway traffic at 100 feet). The major impact to local residents resulting from the operational noise of these transmission lines is annoyance. Reactions to this impact vary depending upon the actual level of noise, distance from the line, and individual sensitivities.(14)

Noise from substations consists primarily of a low-level hum from transformer equipment and corona noise associated with the incoming lines. Impacts from these sources will be similar to those resulting from operation of transmission lines. Automatic circuit breakers in substations, which are activated during circuit failures and in switching operations, can produce a noise pulse of up to 100 decibels. Substations included in the Fiscal Year 1981 Program are not expected to be located close enough to any existing private residences to cause adverse noise impacts.

Pursuant to the Noise Control Act of 1972, State governments have developed and implemented noise control regulations. It is the intent of the Noise Control Act and Executive Order 12088 that Federal agencies comply with substantive State and local noise standards and limitations; BPA will so comply.

b. Biosphere

The construction activities proposed as part of the Fiscal Year 1981 Program would have various potential impacts to plant, fish, and wildlife resources. If it is determined that a proposed action may affect a listed or proposed threatened or endangered species or its critical habitat, formal consultation with the appropriate regional director of the U.S. Fish and Wildlife Service, as required by Section 7 of the Endangered Species Act, will be entered into. BPA will not undertake any action which would jeopardize the continued existence of any species listed or proposed as threatened or endangered, nor will it undertake any action which would result in the destruction or adverse

modification of the habitat of listed or proposed species that have been determined to be critical by FWS.

(1) Vegetation

Most tall growing vegetative species must be removed from new rights-of-way constructed as part of the proposed program in order to prevent power outages caused by trees growing into or falling on conductors.

Construction of transmission lines and substations requires the removal of all native vegetation at tower footings, on access roads, and at substation sites. As a result of the new facilities proposed as part of the Fiscal Year 1981 Program, vegetative growth will be permanently removed from approximately 1-15 acres (0.4-6 ha) of land that would be cleared for each new substation site for a total of approximately 39-41 acres (15.6-16.4 ha). Transmission line tower footings would require the removal of approximately 59-62 acres (24-25 ha) of vegetation. Permanent access roads, constructed where established access roads do not already exist, could also remove all vegetation on approximately 148-156 acres (59-62 ha).^{*} Vegetation removed is disposed of as discussed in Sections IV.A.1.d. and IV.A.2.a.(1) above.

Trees immediately adjacent to the cleared rights-of-way may be indirectly and adversely affected by an increased chance of wind throw and sun scald. Where appropriate, BPA revegetates rights-of-way and access roads with desirable grasses, herbs, and forbs.

(2) Fish and wildlife

(a) Fish Resources

In constructing the proposed new facilities, local impacts to fishery resources may occur because of activities conducted adjacent to the major waterways as well as to the numerous smaller streams that would have to be crossed during construction operations.

^{*} Variations in the acreages required for construction of access roads are due primarily to the fact that approximately 1.0 to 1.5 linear miles of access road could be required per mile of right-of-way (1.0-1.5 km of access road per km of right-of-way) depending upon the topographic conditions encountered during construction. It is not possible at this time to estimate the precise acreage that would be involved in permanent access roads for Fiscal Year 1981, since the possibility of paralleling existing transmission or utility lines would allow for the sharing of access roads, thereby avoiding the necessity of constructing many new roads.

Impacts to fisheries can result from the introduction of sediment caused by the disturbance of topsoil at nearby clearing and construction operations. Nutrients leached from disturbed soils may also be introduced to nearby streambeds and result in an increase in the biological oxygen demand and stimulation of undesirable aquatic vegetation. Wherever possible, vegetative ground cover which poses no threat to transmission line operation is left intact or protected as much as possible from damage by construction activities. Special care is taken to retain as much vegetative cover as possible within 100 feet (30 meters) of a waterway. This protective "buffer strip" effectively serves to minimize sedimentation and streambank erosion by entrapping debris that would otherwise enter the aquatic environment.

In addition to the impacts of adjacent construction activities, small streams will also be affected by fording operations. Where nearby roads or bridges are not available, smaller streams encountered will be either forded or culverts will be constructed in order to provide access for construction and maintenance equipment. During construction, streams encountered are often crossed 20 times or more. After construction, transmission lines are inspected on the ground at least once every year in nonmountainous terrain and twice a year in mountainous terrain when all streams would again be crossed. Prior to construction of the new facilities proposed for Fiscal Year 1981, State officials will be consulted and an agreement will be reached as to which streams may be forded and which will require culverts. Besides the fording of streams during construction and maintenance operations, past experience has shown that, although not authorized to do so, hunters and recreationists using 4-wheel drive vehicles also utilize fords established as part of BPA facility construction, causing additional siltation and disturbance of the local aquatic environment.

Although the installation of culverts can effectively reduce stream siltation caused by the crossing of vehicles, these structures can, in themselves, alter the aquatic environment immediately around the installation. Special measures undertaken by BPA in order to minimize adverse effects such as soil erosion and sedimentation are described in detail in section A-2 and A-3 of Chapter VIII of Appendix B of the Role EIS.

In addition to the physical disturbance of gravel beds that would be caused by fording, the introduction of sediments into an aquatic environment would increase fish mortality by decreasing the flow of clean, oxygenated water through interstices, or spaces in gravel beds. Affected fish may include anadromous and other species highly valued for sport and commercial use. Any decrease in permeability of the gravel bed will directly affect hatching success, growth, and survival of fish fry deposited during spawning. These impacts become increasingly significant when they occur in combination with an increase in water temperature such as that caused by the removal of streamside vegetative cover, and a resulting decrease in dissolved

oxygen content. Normally, the clearing for transmission lines is not extensive enough to significantly increase water temperatures. High levels of suspended sediment can also be expected to cause some gill damage to resident fish.(15)

Local impacts to fishery resources associated with construction are temporary but increased sedimentation may have cumulative impact to downstream water quality. Whenever possible, construction operations will be scheduled to avoid periods of peak spawning activity. Nevertheless, some short term localized reduction in fish production can be expected to occur in those streams that are traversed, especially during and immediately after construction activities.

(b) General wildlife resources

Construction of the transmission facilities and access roads included in the Proposed Fiscal Year 1981 Program will inevitably have some impacts upon wildlife, especially in forested areas. Impacts in these areas would result from the physical disturbance of wildlife habitat caused by opening up new areas to hunting pressures, the operation of heavy equipment routinely used in the construction of transmission facilities, increased human activity, noise, dust, and the physical presence of transmission facilities, all of which could affect existing wildlife behavior and distribution patterns.

The greatest impact to wildlife can be expected to occur as a result of clearing and construction operations in previously natural habitat. Where habitat is suddenly opened by rights-of-way and access roads, resident wildlife populations will be subjected to increased exposure from predators, especially man. Resultant increases in predation or hunting pressure could have long-term impacts on population levels and, if severe enough, certain species may even leave the area. Those Fiscal Year 1981 Proposals requiring new rights-of-way in farmland and other previously disturbed areas would have a lesser impact to wildlife.

Long-term alteration of wildlife habitat is unavoidable, but will have both adverse and beneficial effects. The clearing of the rights-of-way, which includes the construction of access roads where none are available, will reduce the total amount of cover available to resident species of wildlife. Thus, biological carrying capacity will be artificially restricted in this sense, potentially affecting local population levels of some species permanently. This consideration is especially significant in those areas where available cover is limited. In some cases, limited amounts of slash are left in small piles as cover for wildlife. However, in forested areas, clearing of the right-of-way during line construction and subsequent vegetation management will usually result in an increased amount of available forage utilized by many herbivores. This particular impact is becoming increasingly beneficial because of the growing decrease in available big game winter range associated with widespread fire suppression techniques

and timber management practices.⁽¹⁶⁾ On BPA rights-of-way, for example, it has been found that big game species, such as deer, elk, and bighorn sheep, will utilize forage on the right-of-way. Both natural and man-made clearings in forested areas contain a greater percentage of understory vegetation than the surrounding forest.⁽¹⁷⁾ There is apparently no difference in animal use of transmission line rightsof-way as opposed to natural clearings. The clearing of rights-of-way can have another beneficial effect on wildlife by increasing the "edge effect" which results in an increased mixture or juxtaposition of the various vegetative or habitat types, thereby providing a beneficial diversity of both food and cover. However, the clearing of new rights-of-way through old growth timber would be detrimental to species such as the cougar, wolverine, and northern spotted owl, which are more dependent on old growth habitat.

The human activity, noise, dust, and other disturbance associated with construction activities would result in the disturbance and possible dispersion of many of the wildlife species found in the area. This type of effect is expected to be temporary and most of the resident populations of larger wildlife species, especially deer and elk, would reestablish themselves and adapt once construction operations have been completed.

Resident individuals of smaller animal species will be affected to a greater degree, especially the burrowing and ground nesting mammals such as rabbits and various rodents. It is expected that some individual habitats of these species will be destroyed by construction activities; if the individuals are unable to relocate they may perish. This should have only a temporary effect on local species populations because of their adaptability and reproductive capacity. A continuing impact to individuals of these species can also be expected to occur: because of decreased cover, animals occupying the right-of-way will be more susceptible as prey. However, a slight increase in this form of mortality would not pose a biological threat to these species as their ability to maintain themselves in healthy populations will not be affected.

(c) Birds

Transmission line towers, conductors, and static wires can affect bird flight behavior and birds sometimes collide with such facilities. However, transmission lines have not been proven to be a general hazard to bird movements and there is no evidence to indicate that bird mortality due to collisions with BPA facilities is a significant problem. Many bird fatalities in transmission line rights-of-way can be attributed to the increased vulnerability of birds to illegal shooters. Where there is a problem of this type, BPA will cooperate with landowners and land management agencies to restrict public access to rights-of-way where feasible.

Although transmission lines have not been shown to generally represent a biological problem for birds, the potential for such a problem may exist in certain situations. Because of

this potential, BPA will minimize conflicts with birds by the location of new transmission routes away from areas of avian concentration. In areas where unique wildlife populations or habitats might be harmed by construction activities or the presence of a transmission line, routes are generally chosen to avoid the more sensitive locations. The U.S. Fish and Wildlife Service and State wildlife agencies are regularly consulted to assist BPA in identifying those sensitive areas and analyzing the potential impacts of a transmission line location on birds.

Bird deaths caused by transmission lines appear to have had no significant impact on waterfowl populations. However, flocks may be disturbed by the presence of large transmission lines and avoid nearby habitat.⁽¹⁸⁾ Also, direct observation has noted that waterfowl in flight may increase altitude when approaching a line.⁽¹⁹⁾

Therefore, waterfowl hunting near a transmission line may be adversely affected. Again, new BPA transmission line routes will avoid sensitive areas where possible.

Some bird species are less vulnerable to collision than others. Eagles, for example, have keen sight, fly relatively slowly, and maneuver well.⁽²⁰⁾ Eagles and other raptors often make use of transmission towers for nests and perches. The cleared right-of-way provides them with a favorable hunting area. Where increased raptor nesting population is desirable (i.e., where natural nest sites are limited) BPA has provided nesting platforms on transmission towers. The potential for collision may be further reduced by an individual bird's daily flights in an area, familiarizing it with the location of hazards.⁽²¹⁾

Electrocution is not considered a problem with high voltage transmission lines (in contrast to the smaller distribution lines), because conductors are far enough apart to prevent simultaneous contact of a bird's extremities with adjacent conductors⁽²²⁾ and tower hardware.

Research on the impact of transmission lines on avian populations continues. Much remains to be learned about flight patterns, avian behavior, and further means to mitigate adverse impacts.

c. Hydrosphere

(1) Water quality and quantity

Depending on site-specific locations, new construction included in BPA's Fiscal Year 1981 Proposed Program will have a varying degree of impact on water resources. Most of the effects are related to water quality, but some minor effect to water quantity may also occur.

Adverse effects on water quality may be expected from an increase in sedimentation resulting from nearby construction, vegetative clearing, stream fording, and the possible introduction of herbicides into waterways via surface runoff and accidental application or drift. In addition to these effects (discussed more thoroughly in Section IV.A.2.b.(2)(a), Fish Resources), increased sedimentation may, directly or cumulatively, increase stream bedload thereby potentially altering stream dynamics, including channel and course. The potential of these effects is minimized by the mitigating measures discussed in the forementioned section.

Direct effects of the proposed program on water quantity are not expected to be significant, but may cause minor contributions to cumulative impacts from other actions not under BPA control. The primary effect would be a slight increase in total local runoff as the result of vegetative clearing, especially on forested lands; a corresponding decrease of water infiltration into aquifers could then be expected. The majority of these effects would diminish in time with revegetation of the bared lands. However, infiltration may be expected to slightly increase in the long run, because trees removed by clearing are replaced by low growing vegetation which use less water but still block runoff.(23)

(2) Specially protected aquatic resources

(a) Floodplains

Pursuant to Executive Order 11988, BPA shall avoid constructing new facilities within 100-year floodplains unless there is no practicable alternative. For proposed actions that are located within 100-year floodplains, BPA shall comply with Department of Energy requirements for floodplain environmental review set forth at 10 CFR Part 1022.

The specific effects of FY 1981 proposed actions located in floodplains on lives and property, and on natural and beneficial floodplain values will be evaluated and a floodplain assessment will be prepared. Alternatives to the proposal and measures that mitigate the adverse effects of actions in a floodplain will also be addressed. The floodplain assessment will be included in an environmental assessment, site-specific environmental impact statement, or issued separately, as appropriate. BPA will forward the floodplain assessment to the U.S. Fish and Wildlife Service, the U.S. Heritage Conservation and Recreation Service, the U.S. Army Corps of Engineers, and appropriate State and local agencies for review and consultation.

The public will be provided an opportunity for review of a proposed floodplain action by notification in the Federal Register and other appropriate means prior to a decision to proceed with the action; all substantive comments will be taken into account. The public will be notified of any such decision by publication of a statement of findings, including whether the action conforms

to applicable State or local floodplain protection standards and a description of steps to be taken to minimize potential harm to or within the floodplain. The implementation of adopted mitigating measures as described in the floodplain assessment and statement of findings will be verified.

Because of the linear nature of both floodplains and transmission lines, it is inevitable that some will intersect. Where a proposed project would necessarily cross a floodplain, the only practicable location alternatives may be different crossing sites. The floodplain assessment will present these alternatives in comparative form to provide a clear basis for choice among options.

(b) Wetlands

Pursuant to Executive Order 11990, BPA shall avoid constructing new facilities within identified wetlands unless there is no practicable alternative. For proposed actions that are located within wetlands, BPA shall comply with Department of Energy requirements for wetlands environmental review set forth at 10 CFR Part 1022.

The specific effects of FY 1981 proposed actions located in wetlands on the survival, quality, and natural and beneficial values of the wetlands will be evaluated and a wetlands assessment will be prepared. Alternatives to the proposal and measures that mitigate the adverse effects of actions in wetlands will also be addressed. The wetlands assessment will be included in an environmental assessment, site-specific environmental impact statement, or issued separately, as appropriate. BPA will forward the wetlands assessment to the U.S. Fish and Wildlife Service, the U.S. Heritage Conservation and Recreation Service, the U.S. Army Corps of Engineers, and appropriate State and local agencies for review and consultation.

The public will be provided an opportunity for review of a proposed wetlands action by notification in the Federal Register and other appropriate means prior to a decision to proceed with the action; all substantive comments will be taken into account. The implementation of adopted mitigating measures as described in the wetlands assessment will be verified.

Impacts to wetlands are usually avoided because transmission facilities are not normally built in such areas. Where impacts are unavoidable mitigation measures will be undertaken to avoid or minimize adverse effects to wetlands.

(c) Wild and scenic rivers

Pursuant to the Wild and Scenic Rivers Act, 16 U.S.C. Section 1271-1287, BPA will determine if any action in the Fiscal Year 1981 Proposed Program would have a direct and adverse effect on the values for which a wild, scenic, or recreational river area was

established. This determination will be included in a site-specific environmental impact statement or environmental assessment, as appropriate. Consideration will be given to impacts affecting the immediate environment of the river or river segment, as well as to the body of water itself. If this determination is positive, the U.S. Heritage Conservation and Recreation Service, U.S. Forest Service, or other land management agency with expertise or responsibility for administering the river area involved will be consulted to assist BPA in developing alternatives or measures to mitigate the adverse effects of the action.

(d) Navigable waters*

Pursuant to the River and Harbor Act (33 U.S.C. Sec. 403) and 33 CFR Part 322.3(a)(1), a Section 10 permit from the U.S. Army Corps of Engineers is required for the construction of any structure in or over any navigable waters. A determination will be made whether any action in the Fiscal Year 1981 Proposed Program will involve such construction. This determination will be included in an environmental assessment or site-specific environmental impact statement, as appropriate.

All environmental factors relevant to the proposed action will be addressed, which may include conservation, economics, aesthetics, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, and safety. At this time, it is undetermined whether any actions included in the Fiscal Year 1981 Proposed Program will require a Section 10 permit.

* "Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce." (33 CFR Part 329)

(e) Waters of the United States*

Pursuant to the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Sec. 1344) and 33 CFR Part 323, a Section 404 permit from the U.S. Army Corps of Engineers is required for any actions resulting in the discharge of dredge or fill material into waters of the United States. Where the discharge of dredged or fill material into these waters is controlled by a State, BPA will comply both substantively and procedurally with the requirements of that State.

A determination will be made whether any action in the Fiscal Year 1981 Proposed Program will involve such discharge and be included in the appropriate site-specific environmental assessment. All environmental factors relevant to the proposed action will be addressed, such as physical effects on the aquatic environment, ecological effects, and water quality. At this time, it is undetermined whether any actions included in the Fiscal Year 1981 Proposed Program will require an individual Section 404 permit. Under §323.4, most conceivable discharges resulting from BPA actions are already covered by a Nationwide Section 404 permit.

d. Lithosphere

Because judicious location of new transmission facilities can generally avoid sensitive areas, impacts to the Earth's crust resulting from BPA's Fiscal Year 1981 Proposed Program are expected to be minor and short term, except at certain limited facility sites.

* The term "waters of the United States" means

- (1) the territorial seas;
- (2) coastal and inland waters, lakes, rivers and streams that are navigable waters of the United States (see Footnote 18), including adjacent wetlands;
- (3) tributaries to navigable waters of the United States, including adjacent wetlands;
- (4) interstate waters and their tributaries, including adjacent wetlands; and
- (5) all other waters of the United States not identified in (1)-(4) above, such as isolated wetlands and lakes, intermittent streams, and other waters that are not part of a tributary system to interstate waters of the United States, the degradation or destruction of which could affect interstate commerce. (33 CFR Part 323.2(a))

(1) Soils

Removal of plant cover leaves the exposed soil vulnerable to erosion by wind and water. Therefore, vegetative clearing required for the construction of transmission facilities, substations, and access roads included in the Fiscal Year 1981 Proposed Program can be expected to result in accelerated soil erosion. Factors influencing the amount of erosion, such as precipitation, soil type, and slope, are considered by BPA to determine soil erosion potential and to avoid sensitive areas when selecting locations for specific new facilities. Revegetating disturbed areas and designing roads with erosion controls limits the extent of actual erosion.

Alteration of soil structure can also result from construction activities. The use of heavy equipment can compact surface soils, thereby inhibiting root penetration and soil water movement. To avoid compaction, topsoil is sometimes removed and set aside during construction, to be replaced once construction is completed. Otherwise, compacted ground is subsoiled and plowed. Soil structure can be completely destroyed by excavation and fill actions, but this is primarily limited to substations, tower footings, and permanent access roads. Disturbed topsoil is restored to original contours.

(2) Mineral resources

Transmission lines can have an impact on deposits of some low-unit value, high-volume mineral resources which can only be extracted economically through surface mining techniques. The most common of these is sand and gravel.

Known commercial deposits of these low-unit value minerals will be avoided wherever possible when selecting line or route locations. Direct impact to this particular resource as a result of the Fiscal Year 1981 Proposed Program is not foreseen at this time.

B. MAINTENANCE AND VEGETATION MANAGEMENT

1. Impacts of Maintaining Electrical Equipment and Facilities

The maintenance of electrical equipment and facilities would involve the use of helicopters for transmission line patrol and heavy construction equipment for the repair or replacement of electrical equipment, towers, poles, conductors, communications equipment, and roads. The helicopter patrol would normally fly 20 to 25 feet above and to the outside of the line. The frequency of inspection would range from 6 to 8 weeks for critical lines and 3 to 4 months for other lines. The helicopter may disturb nearby residents, livestock, and wildlife. ~~When requested by the property owner,~~ BPA would install detour signs on certain towers instructing the pilot to bypass the area.

*As necessary to protect sensitive
areas such as milk farms*
TM

As an insulator, polychlorinated biphenyls (PCBs) are utilized in some electrical components. BPA possesses PCBs in four forms: PCB transformers, PCB capacitors, PCB storage containers, and PCB nonliquid mixtures such as soil and debris contaminated as the result of spills or leaks. As a toxic substance, the storage and disposal of PCB is regulated by the Environmental Protection Agency at 40 CFR Part 761. BPA's storage facility for PCB at the Ross Complex in Vancouver, Washington, complies with the requirements of an Annex III Storage facility (40 CFR 761.42). This facility is designed to prevent environmental contamination in case of a leak or spill.

Heavy construction equipment such as tractors and trucks would cause limited soil erosion and compaction, as discussed in section IV.A.2.d.(1). Also, occasional stream crossings would cause slight local degradation of water quality, with potential adverse impacts to fisheries, as discussed in sections IV.A.2., b.(2)(a) and c.

Birds can create a hazard to electrical transmission. When nests are built directly over an insulator string, there is a danger that bird excrement deposited on or close to the insulators could result in a flashover and subsequent line outage. Another cause of line outage is that long pieces of debris used by the birds in building a nest can drop and make contact with the conductor. In the past, nests were completely removed from structures. Recently, however, BPA has adopted a policy of not destroying nests. Nests are left intact unless they are located directly over an insulator string. When nests are situated directly over a string of insulators, maintenance personnel would move the nest intact to a distance midway between phases on single circuit structures, or toward the center of the tower on double circuit structures. Experience has shown that birds will remain in relocated nests and will not build a new nest at the previous location.

2. Impacts of Vegetation Management

In some areas, the repeated control of tall-growing vegetation would tend to encourage low-growing species to flourish and spread. Although this may alter wildlife habitat, it is only a continuation of the habitat alteration impacts initiated by construction. In some areas, tall-growing species will perpetually return, necessitating periodic control.

In forested areas, cleared rights-of-way function as limited fire breaks and provide access for the control of wildfires. In developed areas, transmission line rights-of-way may function as desirable open space, recreational areas, gardens, or storage areas.

Where maintenance crew access to the right-of-way would be by ground vehicle, slight soil erosion and localized degradation of water quality at stream crossings may result with potential adverse impacts to fisheries (as discussed in sections IV.A.2., b.(2)(a) and c).

a. Hand and mechanical cutting for vegetation control

The control of vegetation by hand and mechanical cutting alone would demand frequent treatment because the stumps quickly resprout. This would require maintenance crews to work at a site repeatedly. However, the frequency of treatment can be reduced by the application of herbicides to the stumps. Greater use of access roads would result in correspondingly greater erosion and siltation as mentioned above. Erosion on steep terrain would have the greatest significance.

Additionally, increased hand and mechanical cutting is hazardous to the maintenance crew. Any increase or decrease in the use of this method for the control of right-of-way vegetation can be expected to result in a corresponding incidence of injury.

The slash created by hand and mechanical cutting, depending on volume, would be disposed of by lopping and scattering or by hand piling. Slash piles would provide shelter within the cleared right-of-way for birds, reptiles, and small mammals.

b. The use of herbicides for right-of-way vegetation management

The main concern in analyzing the effect of herbicide use on BPA rights-of-way is for human health. People may be exposed to these chemicals directly, during application; or indirectly by contacting or consuming contaminated plants, animals, or water. Of additional concern are the potential effects of BPA herbicide use to animals and nontarget vegetation. To address these concerns, the hazards that would be presented by the use of these herbicides must be examined. The degree of hazard involved depends on 1) the particular toxicity of the herbicides used, and 2) the potential for exposure to them.

Toxicity has been defined as the inherent capacity or potential of a substance to produce harm or injury to a living organism. If the organism is a plant, the poisonous effect is known as phytotoxicity. Toxicity data for herbicides and other chemicals are determined by laboratory experimentation under a certain set of selected conditions with various organisms. Most of these experiments are designed to define a range or establish limit values indicating that, with respect to effectiveness of a chemical, something will not occur below a certain level of exposure to injure some pest (target) organism. These experiments also document safety to other, non-target organisms. At the other end of the scale, these laboratory experiments will suggest that beyond some set laboratory established criteria, a certain degree of control of some pest organisms will indeed occur; and that some form of injury or harm will occur to some form of non-target organism.

Exact duplication of these laboratory test procedures in real life situations will undoubtedly produce essentially similar

results. However, actual pesticide/organism interactions occurring during or subsequent to a pesticide use only in the very rarest of cases resemble controlled, laboratory-type interactions. It is for this reason that, while laboratory data indicating the potential of a pesticide to cause harm are extremely valuable, the test parameters of the pesticide/organism interaction collectively referred to as EXPOSURE must be identified to determine the degree of HAZARD in its use. A hazard can then be defined as: The probability or likelihood that under conditions of use not contrary to label directions and instructions, a chemical will cause some harm to humans, animals, or specific forms of life.

A hazard primarily depends on the intimacy of the contact between the toxic chemical and an organism. Even the most toxic chemical substance (such as the rodenticide "1080" for which there is presently no antidote) will present little or no human hazard if carefully confined and strictly controlled in use. Conversely, a chemical substance of exceptionally low toxicity but with sufficiently wide and heavy exposure will present a considerable human hazard. A good example of this is a common drug such as aspirin found essentially in every household. Aspirin has been involved in many intoxication cases of children with sometimes tragic results consequences of heavy exposure. Aspirin must therefore be considered toxic and potentially harmful. The following factors determine the consequences of chemical contact with an organism: to cause harm or injury to an organism a TOXICANT must be available to that organism IN SUFFICIENT QUANTITY, IN THE RIGHT FORM, at THE RIGHT TIME, and FOR A SUFFICIENT PERIOD OF TIME. Should all these conditions not be adequately met, harm or injury to an organism will not result.

Various groups and individuals have claimed that the use of many herbicides presents an unacceptable hazard to human health. These claims are largely based on unsubstantiated relationships of various symptoms with herbicide use. In themselves, these relationships do not establish positive correlations of cause and effect. The vast majority of scientific investigations to date do not support these claims. However, some questions remain unanswered and research by experts--including the Environmental Protection Agency--continues.

(1) General toxicological considerations

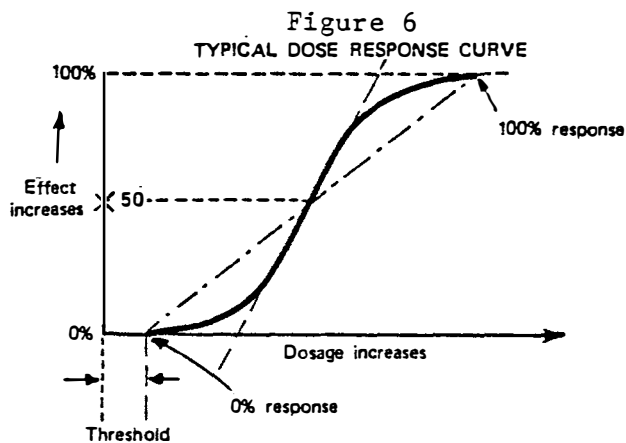
(a) General toxicity

Historically, general toxicity has received the bulk of the research. Early in the use of herbicides, confined initially to crops, it was required that first the herbicide applicator would not be endangered, and secondly that subsequent human consumption of the treated crop would not present a hazard. With the comparatively crude analytical methods in existence at that time, only the highest of residue or exposure levels were detectable in the crops. This gave the impression that herbicide use was essentially hazard free and, therefore, only relatively few herbicide use restrictions were imposed.

With present analytical instrumentation pushing the threshold of detection down to approximately 1 part per billion (ppb) and lower for some chemical substances, a much greater number of chemicals from various sources (many non-pesticidal) are being found in various forms of life. In interpretation of finding a chemical presence, a clear distinction should be drawn between the measures of exposure and any measures of effect. Herbicide and other pesticide levels found in any portion of an organism such as in human or animal tissue or blood, are in themselves evidence of exposure only - not evidence of effect.

General toxicity is expressed in the form of "LD50," indicating in milligrams (mg) of a substance per kilogram (kg) of body weight the Lethal Dose in 50 percent of organisms exposed. Human LD50 is extrapolated from laboratory experimentation with various animals. Any extrapolation to humans should consider known or presumed similarities and differences in body responses of the laboratory animal. In addition, the species, strain, age, and sex of the experimental animal, route of administration, concentration of the test material, and the vehicle in which the active ingredient is administered must be specified and considered when collecting, interpreting, and extrapolating data. The period of administering the toxicant is exceptionally critical: one relatively large single dose (acute exposure), or smaller dosages over a relatively long time period (chronic exposure). It is generally substantiated that pesticides which are rather highly toxic to experimental animals are also usually quite poisonous to humans.

Toxicity to man or animals, as previously stated, can be caused by a single massive (Acute) dosage which overwhelms some or all body functions. Laboratory determination of acute toxicity is relatively simple as it basically requires only adjusting the dosage administered to a statistically significant animal group to cause mortality in half of the test population. Attempts to define toxicity by either the zero, 1 percent, or 100 percent level causes the inclusion in test results of random occurrences in the test population of either extreme sensitivity or extreme resistance to a pesticide substance by a very small percentage of that population. Furthermore, the small incidence of nontest related random mortality inherent in any large test group of animals may lead to substantially erroneous conclusions unless, of course, an extremely large (and unmanageable) test population is used to reduce the significance of these random occurrences. Therefore, tests for relative toxicity are aimed at determining the median lethal dose rather than response extremes. A rather typical dose response curve for a toxin is shown in Figure 6. There is no scale on the dosage because the toxicity of herbicides and other pesticides encompasses a very large range. For a potent toxin, this curve would be in small units of measure such as a few milligrams (mg). With some relatively non-toxic materials, dosages may be expressed in grams, ounces, or even pounds.



(b) Teratogenicity

A teratogen is a substance that causes irreversible birth defects. It appears that many chemicals, if they have teratogenic properties, act on specific fetal structures during certain times of their development. Collected data suggests that if sufficient exposure to a teratogen occurs early in the development of the fetal body while its cells are still quite similar, the exposure will cause generalized and catastrophic damage and the fetus will not survive. If exposed later in development, the fetus may survive even though badly deformed.

In humans, teratogenetic injuries for any reason are considered to be confined to the first trimester of pregnancy. At that time, development of a human fetus is essentially complete and no longer subject to teratogenesis. Fetal malformations can be initiated by many nonspecific causes: psychological or physical stress, starvation, or injury to the mother are all capable of initiating teratogenic damage. Teratogenic injuries or effects can not be transmitted to the next generation⁽²⁴⁾.

(c) Mutagenicity

A mutagen is a substance that causes changes in the physical or biochemical characteristics of an organism that can be transmitted to later generations as genetic alterations. Mutation is not necessarily induced by a sufficiently large exposure to a chemical, it may be a natural genetic occurrence. Evolution has been a long series of mutations that have genetically selected characteristics most useful for survival. The concern is for the potential of a chemical to alter the deoxyribonucleic acid (DNA) which is found in cell nuclei and is responsible for determining individual hereditary characteristics.

It has been conjectured that, if chemicals (including herbicides and other pesticides) may alter the DNA, then differences in cellular growth characteristics may result which is also the principal characteristic feature of cancer. As such, any laboratory

observed mutations may suggest that the tested chemical is also a carcinogen. Since it has been found that an estimated 95 percent of all chemicals will in some way react with DNA, testing for mutagenicity has some serious interpretative problems. Extensive lab testing has shown that it was most productive to use the lack of observed mutation as an indicator of the absence of carcinogenic potential⁽²⁵⁾.

(d) Oncogenicity

An oncogen is a substance or a medium which initiates abnormal and progressive growth of tissue which never reaches growth equilibrium as tissue undergoing repair will do. It may be considered a distortion of the controlled cell division process. The resulting growth of tissue is called a tumor. Tumors, because of significant differences, can be divided into two groups: the benign tumor and the malignant tumor.

A benign tumor grows relatively slowly. It may produce a fibrous capsule which surrounds its growth. Benign tumors normally are considered harmless unless they occur at locations where physical displacement of normal tissue may cause pressure, blockage, or disturbance of hormonal balance. A disturbing feature of a benign tumor is its potential to change into a malignant tumor.

A malignant tumor grows relatively fast. In growing, a malignant tumor invades and permeates surrounding tissue. This may include vital organs if they are nearby, eventually disturbing to some degree the specific functions of these organs. With continued growth, and upon entering the circulatory or lymph system, malignant tumors spread to distant sections of the body and initiate new growth at those locations. A malignant tumor is normally called cancer.

Common to both forms of tumors is the considerable lag between the initiation of tumorous growth at the single cell level and its identification or detection in man and animals. In humans this delay or latent period is estimated to be between 10-40 years⁽²⁶⁾.

(e) Carcinogenicity

Cancer is a self replicating disease that is characterized by a disorganized production of abnormal cells, in a mass or disseminated, and not subject to the same kind of regulation as normal tissue growth is. Cancer may at times be referred to as malignant tumor⁽²⁷⁾. A substance that causes cancer is known as a carcinogen.

Carcinogenicity, as are other harmful effects of herbicides on forms of life, is dose-related; that is, the higher the dose the more malignant tumors will be produced and/or the shorter the latent period. Animal experimentation studies into the

carcinogenic potential of chemicals have suggested that, while all chemicals of a sufficient dose are toxic, they are not necessarily carcinogenic. To demonstrate the carcinogenic potential of a chemical with a sufficiently high dosage is not very difficult. At low dosages or with chemicals having only weak carcinogenic potential, it becomes more and more difficult to discriminate test induced cancers from the randomly occurring level of cancer induced by factors external to the chemical exposure.

Some types or strains of test animals are particularly sensitive to the development of certain tumors. Also the degree of response by different test animals may vary considerably to similar exposures, making extrapolations to other animals or humans more questionable. The nutritional intake of test animals also appears to influence the degree of response to an exposure.

It also has been found that individually noncarcinogenic chemicals, when combined, may induce cancer. There is a question as to the proper classification as carcinogens of the chemicals involved in this type of synergistic reaction. However, it is not possible to test a population of test animals large enough and long enough, extrapolate the findings to humans, and state with confidence that a chemical has absolutely no carcinogenic potential, including potential synergistic effects with a variety of other substances.

It is theorized that exposure to only one molecule of a carcinogen may initiate cancerous growth. If this is so, then there is no safe level for exposure to a carcinogen. By contrast, it is also theorized that there is a threshold level for a carcinogen in humans and animals. Dose response curves constructed from laboratory carcinogenicity research have not indicated whether a threshold level of low exposure can be expected below which exposures to a carcinogen will not produce cancers.

(2) General fate and persistence of applied herbicides

Knowledge of chemical and physical properties of herbicides is necessary to determine or forecast how the applied chemicals are going to be acted on by the chemical and physical forces in the environment.

Herbicides which collectively will be only slightly affected by these environmental forces may be able to persist unchanged longer in the environment and thus be able to act longer on various forms of life susceptible to them. Their cumulative effect thus may be significant. By contrast, herbicides which will be affected strongly by prevailing environmental factors will only be able to act on susceptible forms of life for a relatively short period of time. Their cumulative effect will be less significant or, in fact, could be absent or nondetectable.

Upon application, herbicides will be distributed into four major portions of the environment: air, vegetation, soil, or water. The proportion of herbicide entering each segment of the environment will be determined by the type and particulars of the application method, the type and formulation of the herbicide used, and the environmental conditions existing at the site of application. Subject to the laws of physics, herbicides may, after application, move from one component of the environment to the other without a change in their chemistry. Examples of this are the volatilization of deposited herbicides from a sunbathed soil surface into the air, or herbicide treated leaves falling onto and becoming part of the soil profile.

In this gradual shifting process between the four major portions of the environment, dispersion and dilution of herbicide contamination will take place. Even if during this dispersal and dilution herbicide levels drop to or below the threshold of detection, this process in itself does not remove herbicides from the environment. It does, however, expose the herbicides to numerous natural forces in each portion of the environment which will act on the herbicides and break them down. The breakdown process causing a change in the chemistry of the herbicide molecule is the only terminal solution because it alone causes the removal of the herbicide from the environment. The following natural processes begin acting on the herbicides as soon as they are released by one application method or other into the environment.

(a) Drift

By definition, drift is the loss of herbicides or other pesticides out of the target area between their point of release from an application device and its impingement on vegetation, soil, and water surfaces. Drift does not include a change in the chemical structure of the herbicide; at the very most it includes a change in the physical state of the herbicide from liquid to vapor. Drift is greatly determined by the physical characteristics (liquid, granule, powder, or pellet) of the released product. Type and operating mode of application devices is also significant in determining the amount of drift, especially with application of a liquid herbicide solution to target foliage. Any liquid, including a herbicide solution, when discharged under pressure through a nozzle or orifice, is not broken down into droplets of uniform size. Instead, the droplet produced by a nozzle normally covers a wide range of sizes from minute foglike particles to those resembling a fine rain. Droplets of different size will be affected and behave differently in response to the environmental conditions in the target area.

Application of herbicides in liquid forms to cut surfaces or lower tree trunks (basal treatment) with tree injectors, plastic squirt bottle, backpack type sprayers, and low pressure hose sprayers does not present a drift potential of any significance. A small target zone, close proximity between application device and target, and a low volume of herbicide discharged under low pressure makes

these methods of application drift free for all practical purposes. Because of this high degree of safety inherent in these methods, they are the methods of choice in close proximity to bodies of water.

With high pressure hose application, the characteristics of the produced spray particles and their longer travel distance to the target vegetation exposes the herbicide more to environmental influences. The probability of some drift to occur is greater with the high pressure hose than with low volume, low pressure, handheld application devices. Selection of equipment should reflect consideration for optimum coverage of the target vegetation, without excessive herbicide consumption and with a minimum amount of drift.

With aerial application of liquid herbicidal sprays, many factors have a significant effect on the degree of drift potential. This is shown as a cause and effect relationship in Table 6. Control over the size of the spray droplets produced and their surface property is most critical in determining what percentage of the released spray will impinge on vegetation in the target zone and what percentage of spray will be lost out of the target zone. Tests with agricultural aerial application of herbicides suggest that a high percentage of the released material does reach the target zone whenever criteria to minimize drift factors are followed. In transmission line right-of-way aerial application the herbicide spray is released at a greater height than with agricultural application, thus losses out of the target zone could conceivably be higher.

Considerable research, however, has produced a number of specialized application equipment and additives which, by greatly eliminating fine spray particles, produce herbicide sprays considerably less subject to drift than those commonly used in agriculture. Visual examination of vegetation bordering BPA's rights-of-way that have been treated by aerial application in the past reveals a significant and rapid decline in phytotoxic effects at the edge of the target zone. Although this is not a scientifically accurate determination, it does demonstrate that, with the precautionary measures employed, drift is minimal and generally below the threshold of biological significance in the plant community bordering the rights-of-way.

(b) Volatility

Volatility is the tendency of a chemical to go into a vapor state which results in a loss of applicator control over its movement in the environment. Volatilization does not involve a chemical change of the herbicide but merely a change in its physical state. The volatility potential of a herbicide is mainly determined by its vapor pressure. In most cases, the higher its vapor pressure the more likely a herbicide is to evaporate and be lost.

TABLE 6

EFFECT OF VARIOUS FACTORS ON HERBICIDE DRIFT

Less Drift	Factor	More Drift
Lower	A. Release Height	Higher
Lower	B. Wind Speed ⁽¹⁾	Higher
Faster	C. Droplet Fall Rate	Slower
Larger	1. Droplet Size	Smaller
Lower	a. Pressure	Higher
Jet	b. Nozzle Type ⁽²⁾	Wide angle cone or fan
Larger	c. Orifice Size	Smaller
Lower	d. Air Shear on Spray	Higher
Higher	e. Surface Tension ⁽³⁾	Lower
Higher	f. Relative Humidity ⁽⁴⁾	Lower
Higher	g. Viscosity	Lower
Higher	2. Drop Density ⁽⁵⁾	Lower
Lesser	D. Air Stability	Greater
Lesser	E. Aircraft Turbulence	Greater
Slower	1. Speed	Faster
Clear	2. Aircraft Aerodynamics	Rough
Climbing	3. Flight Attitude	Falling
Closer	4. Nozzle Location on Boom from Center	Farther out
Smaller	F. Size of Treated Area	Larger

(1) Below speed at which air stability is reduced.

(2) Certain nozzle types can produce larger drops or narrower range.

(3) Higher oil or surfactant content reduces surface tension.

(4) Important with evaporative carriers (water).

(5) Oil carriers are lighter (less dense) than water.

Source: L. E. Warren, "Controlling Drift of Herbicides," The World of Agricultural Aviation, March 1976.

The volatility potential of various herbicides and their formulations may vary by a factor of 20,000 or more. Volatility increases as temperature increases. Under full exposure to sunlight, soil surfaces may reach temperatures significantly higher than ambient air temperatures resulting in an increase in volatilization losses. As a vapor, the chemical may be most readily moved out of the target area and lost as it will not contribute to the control of the target vegetation. In leaving the target area, the herbicide may affect other vegetation nearby, depending on their susceptibility. The most common method of minimizing volatility losses is to use herbicidal formulations which have an inherently low volatility potential. High temperatures during application and post application periods should be avoided as much as possible.

(c) Adsorption

Adsorption is one of the principal processes determining the fate of a chemical. Adsorption of herbicides or other chemicals is their degree of affinity or attachment to microscopic organic and inorganic soil particles. Adsorption is a physical process and does not chemically affect the structure or property of the herbicide. The process is reversible, adsorption when the physical bond is established and desorption when this bond is broken.

The strength and extent of the adsorption process depends on the type of soil including its organic content, moisture content, temperature, and acidity/alkalinity; and the type of herbicide, its formulation, and water solubility. Clay and humic soils are high in adsorbency; sandy soils are low in adsorbency. As a rule, chemicals with high water solubility are less adsorbed than those with low water solubility. There are, however, exceptions to the rule.

Adsorbed herbicides may be considered inactive as they will not move in the soil and are not available for uptake by plants. Only that portion of herbicides in the soil profile which is not adsorbed and remains in the soil solution is able to move in the soil profile, either horizontally or vertically, or be taken up by plants.

The proportion of chemical adsorbed and that in the soil solution is in a state of equilibrium. Any loss or breakdown of herbicides at one point in the soil profile will cause desorption of chemical at that location. In effect, adsorbed herbicides are stored or reserved for later emergence into the soil solution.

(d) Leaching

Leaching is the physical movement of water soluble material, in solution, through the soil profile. Leaching may occur downward, upward, or horizontally, and does not in itself alter the chemical structure of herbicides.

The degree of herbicide leaching is determined by the particular water solubility of the herbicide formulation and the amount,

direction, and intensity of water movement in the soil profile. The intensity and duration of precipitation and its temporal distribution has a significant influence on this moisture movement, as do evaporative losses from the soil surface and transpiration losses by the local plant community. The leaching of herbicides is confined to that portion which is dissolved in the soil solution. Adsorbed chemicals will not leach until they are desorbed as a result of a loss of chemical out of that location. Leaching will distribute soil intercepted herbicide throughout a greater soil volume with a greater total adsorptive capacity, progressively limiting any chemical movement. A greater soil volume permeated by a more dilute herbicide solution may accelerate the chemical breakdown process by increasing the degree of interaction with various soil constituents, including its microorganism population.

(e) Microbial breakdown

The molecular structure of most herbicides can be significantly altered or broken down by diverse soil microorganisms, in most cases rendering the herbicides non-phytotoxic. Breakdown rates may vary significantly between compounds. Differences in breakdown rates of herbicides are caused by how well and how rapidly the body functions of these soil organisms adapt themselves to the chemicals being encountered. Soil microorganisms appear not to be adversely affected by normal rates of herbicides intercepted by and distributed in the soil profile.

Microorganisms break down herbicides and other chemicals to use some of the molecular constituents or fragments for their energy requirements and for growth. Organic herbicides, or their fragments, containing carbon atoms are of particular value to them. Inorganic herbicides not having carbon atoms are generally broken down at a slower rate or not at all.

Soil properties conducive to a large and diverse microbial population, such as adequate moisture, warmth, aeration, and nutrients will greatly increase specific herbicide breakdown rates. Conversely, dry, cold, poorly aerated, and infertile soils are not conducive to a rapid herbicide breakdown rate.

(f) Chemical breakdown in soil

Upon entering the soil profile, herbicides will be exposed to a host of organic and inorganic soil constituents. These include air and water at some particular temperature which will affect the chemical composition of herbicides. Soil chemistry will also affect herbicide breakdown rates. Some herbicides will be broken down through a number of processes, in most cases losing their phytotoxic properties. This may involve a relatively large number of intermediate steps.

Most frequently, chemical and microbial breakdown occur simultaneously in the soil, and it is hard to distinguish their separate effects. Leaching in the soil profile contributes considerably because it distributes the chemical through a larger soil volume, thus making the soil to chemical contact more intimate and accelerating the total herbicide breakdown

rate. Breakdown of herbicides in the soil is probably the major route of eliminating herbicides from the environment.

(g) Chemical breakdown in plants

Herbicides absorbed into the plant via the foliage, roots, stems, or trunk may, to a degree, be excreted unchanged into the soil profile through its root system. Excretion may be relatively quick or may follow temporary storage in the plant. Metabolic processes in the plant may alter the absorbed chemicals, in most cases affecting them so they are no longer phytotoxic. Metabolic processes differ between plants which results in different breakdown rates and different breakdown end products.

(h) Photodegradation or decomposition

Photodegradation is the chemical change of a compound caused by various components of sunlight, predominantly the ultraviolet portion of the spectrum. Breakdown products are normally smaller molecular fragments without phytotoxicity. The extent of photodegradation as a route of eliminating herbicides from the environment is not generally agreed on. However, it does not appear to be a significant cause of herbicide breakdown.

(3) Analysis of herbicides proposed for use

(a) 2,4-D

2,4-D (Dichlorophenoxyacetic acid), together with 2,4-DP, 2,4,5-T, and 2,4,5-TP (Silvex), are the principal members of the phenoxy group of herbicides. While these chemicals may have many similarities in their manufacture and their mode of action on plant life, they also have many dissimilarities in both areas; thus extrapolation from one herbicide to another should be made with caution to avoid error. This caution especially applies to the impurity in 2,4,5-T, known as TCDD. Differences in the 2,4-D manufacturing process preclude the formation of TCDD. 2,4-D therefore does not contain any TCDD impurity(28)(29).

2,4-D, in various ester or amine forms, is sold under a host of tradenames both individually and in combination with other herbicidal ingredients such as picloram, dicamba, 2,4,5-T, etc. 2,4-D use in agriculture for weed control is extensive, accounting for approximately 80 percent of the total annual use in the United States (55 million pounds) in 1975. 2,4-D affects many species of deciduous trees, brush, and broadleaf weeds. Grasses are generally not affected by normal rates of application. A hormone type growth regulating herbicide, 2,4-D interferes with the cell division and enlargement of susceptible plants; it also interferes with food utilization and with a wide array of other vital processes. The exact mechanisms of these actions is not known; however, it is known that chemicals having growth regulating effects on plants do not act in the same way on animals, thus exhibiting considerably less effect--including toxicity--in animals(30).

BPA would use 2,4-D to control pest trees, brush, and noxious weeds on rights-of-way and access roads. The maximum application

rate for 2,4-D at BPA would be six pounds of active ingredient (A.I.) per acre. All 2,4-D used by BPA is the low volatile ester form or an amine formulation. No highly volatile 2,4-D formulations would be used by BPA. Essentially all 2,4-D would be used in foliar spraying both from the ground and by helicopter. Most of the 2,4-D used at BPA would be used together with picloram or dicamba field mixed or premixed in commercial formulations; it would not be used in formulations containing 2,4,5-T or Silvex. Some minor use of 2,4-D by itself would be confined generally to weed control in turf and in some noxious weed control efforts.

1. Degradation of 2,4-D in the environment

a. Persistence in soil

2,4-D is adsorbed readily by organic soil components. 2,4-D is not readily adsorbed by inorganic soil components including clay. The adsorptive bond to organic soil components is not strong; thus, 2,4-D may be quite easily desorbed⁽³¹⁾. 2,4-D generally does not leach beyond approximately 12 inches in depth even with soils low in organic matter. With organic matter present, nearly all of the 2,4-D is confined to the uppermost 2"-6" of the soil profile. 2,4-D in the ester form is somewhat less mobile than the acid or salt formulation.

Noteworthy are the results of an experimental incorporation of up to 4000 lbs/acre of 2,4-D together with 2,4,5-T in the uppermost 4"-6" of the soil profile at a site in Utah. 282 days after application residues were detectable down to 36" soil depth; however, 90 percent of the applied materials were still found within the uppermost 12" of the soil profile⁽³²⁾. Past BPA monitoring of fate and persistence of 2,4-D applied to its right-of-way system at rates up to 6 lbs/acre have shown that only very small percentages, if any, were found below the 6" soil horizon, especially when organic matter was present. In those cases by far the greatest portion of 2,4-D remained in the humus layer. As a source of herbicide entry into forest streams, leaching is probably less important than direct input during spraying operations.

Some photochemical degradation due to sunlight does occur with 2,4-D. The extent, however, is not known in detail. Type of formulation, concentration, and whether the 2,4-D is on the soil surface or in a solution all have a bearing on breakdown rates. Overall, photodegradation is not thought to be a significant factor responsible for the disappearance of 2,4-D from the environment⁽³³⁾.

2,4-D in its amine salt or ester form is converted rather rapidly into the acid form both in soil and water. The acid will then be acted on by various soil and water constituents and chemically degraded further by interaction with soil components or by soil microorganisms⁽³⁴⁾.

Microbial breakdown of 2,4-D in the soil is probably the principal mechanism of degradation. Conditions suitable to a large microbial population (soil fertility, temperature, and moisture)

are also conducive to rapid breakdown of 2,4-D . Upon exposure of the soil profile to 2,4-D the microbial population apparently goes through an adaptation process in order to utilize components of the 2,4-D molecule. This suggests that repeated applications of 2,4-D will be broken down faster by microbes and residues would subsequently diminish faster.(35)

Surface runoff may remove some of the applied 2,4-D from the treatment area. The main factors determining the extent of runoff are topography, permeability of the soil surface, the nature of the soil cover; and the intensity, timing and duration of rainfall, especially for the first few days following applications. The distance and surface features between the treated area and a body of water will ultimately determine if herbicide entry will occur into the water should some surface flow occur in the treated area(36). Runoff is much more predominant in agricultural areas, which at times have insufficient ground cover to aid water infiltration. In rights-of-way there is normally a substantial amount of ground cover and extensive surface runoff is not common except on very steep topography or during certain phases of transmission line construction.

The volatility of 2,4-D formulations proposed for use by BPA is very low. Therefore, losses of 2,4-D from the treated areas, because of volatilization, would be very low. Also, atmospheric sampling before and after rainfall showed a very significant reduction of vaporized 2,4-D by rainfall. This suggests that rain washes 2,4-D vapor out of the atmosphere, as verified by 2,4-D residues found in collected rainwater(37).

Laboratory studies showed 2,4-D to have a soil half-life of 4-20 days. Bioassays showed that soil with a 25 ppm 2,4-D content (equivalent to a 50 lb/acre application assuming all 2,4-D to remain in the the 0"-6" horizon) had essentially lost its phytotoxicity in 8 weeks. Soybean bioassays showed that 2,4-D did not persist in field soil more than 49 and 93 days following application of 5 lbs and 20 lbs/acre, respectively. Another test showed no phytotoxic residue in 5-6 weeks(38). Lab persistence studies revealed that 2 lbs/acre of an amine salt of 2,4-D applied to forest floor material showed a rapid breakdown with 90 percent of the 2,4-D disappearing in two weeks. It was also shown that addition of other herbicides to 2,4-D were not likely to affect the soil breakdown of 2,4-D(39).

Four lbs/acre of 2,4-D applied to Red Alder forest floor material resulted in a 55 percent recovery after 10 days, 16 percent after 20 days, and 5 percent after 35 days(40). Monitoring 2,4-D soil residue on a BPA right-of-way at a high elevation site in the Oregon Cascades showed an 86 percent loss of 2,4-D from the 0-6" soil horizon over a 7 month period beginning approximately 3 months after a 6 lbs/acre aerial application. Soil residues declined from 380 ppb to 53 ppb in this period.

Previous treatment history with 2,4-D appears to have a notable influence on soil persistence of 2,4-D, presumably due to microbial adaptation as previously indicated. Initial application of 2 lbs/acre of 2,4-D was toxic to white mustard for 10 weeks but after 18 years of consecutive 2,4-D treatment, toxic effects to white mustard was detected for only 4 weeks in the same soil(41).

b. Persistence in water

Direct entry of some 2,4-D may inadvertently occur into water at the time of application. Subsequent runoff from treated areas or rainwashing of tall vegetation adjacent to bodies of water may cause additional entry into water. Also, some 2,4-D formulations have specific label uses for the control of certain aquatic weeds and are purposely introduced into water.

Eleven watersheds in Ontario, Canada, covering 120,000 acres were treated with approximately 6,750 lbs of 2,4-D. Based on water monitoring, the total outflow of 2,4-D within the entire streamflow was calculated to have been less than one pound of 2,4-D in the entire area⁽⁴²⁾.

Application of 2,4-D for aquatic weed control in a Tennessee River Reservoir at 20 and 40 lbs/acre acid equivalent resulted in finding only two water samples which contained 2 and 11 ppb 6 months following treatment. One sample of plankton collected contained 370 ppb of 2,4-D on a wet weight basis. No detectable 2,4-D was found in fish. In mussels the residues ranged from 50-260 ppb following application. None of the mud samples taken 6 months following application contained 2,4-D residues⁽⁴³⁾.

An experimental treatment of 9 ponds in the Gulf States with up to 8 lbs/acre of 2,4-D amine showed water residues from 345-692 ppb, mud residues from 47-170 ppb, and fish residues from less than 5 ppb to 102 ppb for 1-14 days following application⁽⁴⁴⁾.

In a project of approximately 1,200 acres in eastern Oregon treated by air with 2 lbs/acre of low volatile 2,4-D esters, stream water flowing through the treatment area was monitored for spray residues at two sites approximately 1 mile apart. Approximately 2 miles of the streambed was in the general treatment area. With the extent and the effectiveness of the streamside buffers unknown, a peak concentration of 132 ppb was recorded 1.7 hours after treatment at the upstream sampling point. Subsequent residues at 14, 27, 38, and 81 hours were 51, 3, 9, and 1 ppb respectively. At the downstream sampling site residues reached their peak concentration of 14 ppb 14 hours following application. Subsequent residues at 38 hours and one week following application were found to be 6 and 1 ppb respectively⁽⁴⁵⁾.

A portion of the aquatic 2,4-D has been observed to be entrained by plants, including plankton and algae, with proportional concentrations 10-100 times greater than that of the water. Aquatic fauna feeding on these plants will also ingest these residues. However, studies show that fish and oyster tissue rapidly lose 2,4-D residues after cessation of exposure, with a 50 percent loss in less than two days. To what degree excretion and breakdown is involved is not accurately known⁽⁴⁶⁾.

In another experiment, channel catfish, bluegill, and largemouth bass were exposed to 2,4-D at concentrations of 0.5,

1.0, and 2.0 ppm. Total residues of 2,4-D and its metabolites were then measured in whole fish and tissues. At the (higher concentration, largemouth bass contained whole body residues of 1.06, 1.15 and 1.21 ppm after 4, 7, and 14 days of exposure respectively. Bluegills and channel catfish showed residues of 0.45 and 0.75 ppm after similar periods of exposure. In each of these species, bile had the highest concentration, with muscles having the lowest tissue concentration⁽⁴⁷⁾.

Seven stream monitoring projects at six BPA right-of-way sites in western Oregon and Washington where 2,4-D was aerially applied at rates up to 6 lbs/acre generally showed only low-level, short duration entry of sprayed materials. With all streams except one stream having a flow rate estimated between 1 to 10 ft³/sec, 2,4-D residue peaks from approximately 1-2 ppb up to 44 ppb were found. From these peak values residues dropped to essentially background level within 90 minutes to 22 hours following the 2,4-D application. At one monitoring site no residue was detected at all. At another site, low level residues of 2,4-D were found for nearly six months. At this site, terrain features, extensive upstream agricultural utilization, the size of the stream involved, and its large drainage area strongly suggest upstream water contamination by agricultural herbicide users.

c. Persistence in Vegetation

Persistence of 2,4-D in vegetation is initially dependent on the amount of the herbicide intercepted by plant surfaces. In powerline right-of-way spraying, aerially applied chemical spray will frequently be intercepted by more than one vegetation level. Any one vegetation component is therefore likely to have less than the total dosage deposited in the target zone. Persistence further depends on how much of the deposited herbicide is absorbed into the plant system and how much of the herbicide is lost from the plant surfaces by rainwash, wind, volatilization, and photochemical degradation. Other losses from the plant which must be considered are exudation of the chemical by plant roots, leaf fall in case of deciduous plants, and the metabolic breakdown of herbicides within the plant.

Monitoring the persistence of a one lb/acre 2,4-D application on forage grass found an initial residue of 100 ppm. In two weeks the residue had dropped to 50 ppm; at 8 and 16 weeks the residues were 6 and 1 ppm, respectively⁽⁴⁸⁾.

BPA's maximum 2,4-D application rate of 6 lbs/acre would result in a distribution of a 60 mg/ft² on the right-of-way. This is based on target interception of all released material without any spray losses.

2. Toxicity data

a. Acute toxicity - Oral

Research on the toxicology of 2,4-D suggests that 2,4-D is "Moderately Toxic" to humans. Its Acute Oral LD50,

depending on formulation is estimated to vary from approximately 80 mg/kg to 500 mg/kg for humans. This translates into an oral intake of one teaspoon to one tablespoon of 2,4-D for a 150 lb. average person for a 50 percent probability of mortality⁽⁴⁹⁾.

*Oral LD50 2,4-D as acid	- mouse (m)	--	368 mg/kg
*Oral LD50 2,4-D as acid	- rat (m)	--	375 mg/kg
*Oral LD50 2,4-D as acid	- guinea pig	--	320-469 mg/kg
*Oral LD50 2,4-D as acid	- dog	--	100 mg/kg
*Oral LD50 2,4-D as acid	- chicks	--	541 mg/kg
**Oral LD50 2,4-D unknown formulation	- mule deer	--	400-800 mg/kg

For additional toxicity data refer to Appendix 1, Supplementary 2,4-D Laboratory Toxicity Data.

Sources: *National Research Council of Canada, Phenoxy Herbicides - their Effects on Environmental Quality (1978).

**Dow Chemical Company, Phenoxy Herbicides Reference Information (1972).

b. Subacute toxicity - Oral

Steers were orally dosed with alkanolamine salts of 2,4-D for five days out of every seven at 250 mg/kg. Toxic signs began to manifest after 15 administrations. At a reduced rate of 100 mg/kg toxic signs did not become evident until after 86 dosages.

Sheep tolerated 481 daily doses of 100 mg/kg of 2,4-D as alkanolamine or polyglycol butylether ester (PGBE). Pigs did not show any abnormal behavior after single oral doses of 200-800 mg/kg of 2,4-D. One animal out of a group of cattle died after being orally dosed for 34 days with 200 mg/kg of 2,4-D alkanolamine salt. For additional toxicity data refer to Appendix 1, Supplementary 2,4-D Laboratory Toxicity Data.

c. Inhalation toxicity

The time weighted average concentration permissible of 2,4-D vapors in air for occupational exposure has been set at 10 mg/m³ by the National Institute for Occupational Safety and Health (NIOSH).

d. Dermal toxicity

There appears to be little hazard of transport of 2,4-D through the skin. However, individual allergies can develop leading to dermatitis⁽⁵⁰⁾.

e. Carcinogenicity

Two hybrid strains of mice (both sexes) were treated with 2,4-D isopropyl ester orally administered by stomach tube at doses of 46 and 100 mg/kg of body weight for 7-28 days of age, and at concentrations of 149 and 323 ppm in unlimited diet from 28 days of age until 18 months. Also, 2,4-D esters were administered by the same methods at 46 mg/kg body weight for 7-28 days of age, and at 111 to 149 ppm from 28 days of age until 18 months. No significant increase in tumor incidence as compared to the control group was reported. In a 2-year feeding study, rats received a diet of up to 1,250 mg/kg. There was a statistically significant increase in the proportions of females with tumors and males with malignant tumors with increasing 2,4-D dosage. However, the tumors were randomly distributed, not indicating a target organ(s), and mortality rates were not affected⁽⁵¹⁾.

Five rats exposed daily to 1 ml of a 2 percent unspecified 2,4-D water solution in their diet for 6 months showed no incidence of tumors. Likewise 11 dogs exposed to an unspecified 2,4-D formulation at 2, 5, 10 or 20 mg/kg in capsules for 5 days out of every week for a period of 13 weeks did not exhibit any tumors⁽⁵²⁾.

f. Mutagenicity

There is only very limited information available on the mutagenic potential of 2,4-D and other phenoxies. Some test results suggest that 2,4-D may have mutagenic potential while other researchers did not find mutations. The likelihood of significant mutagenesis occurring from normal use of 2,4-D appears to be small⁽⁵³⁾.

g. Teratogenicity

Sensitive lab tests which involved injection of 2,4-D into the yolk sack of fertile chicken eggs produced terrata and chick edema syndrome. However, it is highly questionable whether these test results can and should be extrapolated to actual exposure in field use of 2,4-D. Other testing with 2,4-D on rats at rates up to 87.5 mg/kg/day showed no teratogenic effects⁽⁵⁴⁾.

Some researchers have reported that 2,4-D, MCPA, and purified 2,4,5-T induced physical defects in fetuses of laboratory animals orally exposed to high levels of these herbicides. Embryotoxic effects, including teratogenesis, were noted. The doses which induced these effects were 50-150 mg/kg of body weight for 2,4-D and MCPA, and above 10 mg/kg of body weight for 2,4,5-T⁽⁵⁵⁾.

h. Reproduction. Reproduction capability in the rat was unaffected by 2,4-D at levels up to 500 ppm in diet (equiv. to 25 mg/kg/day) in a 3 generation study. Dietary levels

of 1,500 ppm in the mother's diet reduced body weight and survival of pups to 21 days of age. In another test, 1,000 ppm of 2,4-D in drinking water of rats during and after pregnancy induced no adverse effects on pregnancy and litter size. No malformations or clinical abnormalities in the pregnancies were reported⁽⁵⁶⁾.

Embryotoxicity of 2,4-D herbicide was investigated in 1972 and 1974 by spraying eggs with 2,4-D at the recommended field application rate and 10 times that. No adverse effects on hatching success or embryo and chick development was noted. Other testing which included dipping, immersing, or injecting eggs with 2,4-D and other phenoxies did produce various toxic results. Such exposures, however, have very little resemblance to actual field conditions and therefore should only be extrapolated with caution⁽⁵⁷⁾.

i. Oral uptake by humans and mammals

With mammals and birds, more than 80-85 percent of ingested 2,4-D in its acid or salt form is absorbed from their digestive tract under most conditions. Absorption rates for the esters of 2,4-D were somewhat lower. The degree of absorption does not appear to be affected by the severity of exposure⁽⁵⁸⁾. Urinary excretion of absorbed 2,4-D from the body is rapid because phenoxy herbicides are distributed throughout the body. After exposure, the time required for 2,4-D residue in the blood of a mammal to drop 50 percent was found to be between 2.7 and 33 hours, with rats, pigs, dogs, sheep and calves being the mammalian representatives⁽⁵⁹⁾.

Small amounts of phenoxy herbicide may also be passed to the young via the mother's milk. With cows, the concentration of 2,4-D in the milk was found to be less than 0.1 percent of the 2,4-D content in the feed of the cow⁽⁶⁰⁾.

Because 2,4-D is not likely to be accumulated through successive steps in the food chain, the only species to be concerned with are those herbivores that may feed on treated vegetation⁽⁶¹⁾. Researchers sprayed alfalfa and brome grass with two to four times the usual quantities of various 2,4-D formulations and then fed it to sheep, chicken, pigs, dairy cows and steers. They concluded, under those conditions, that these compounds were not injurious to livestock. However, they did note an off-flavor in the milk⁽⁶²⁾.

3. Reported effects on humans and animals

Spray operators in Canada have reported experiencing symptoms such as headaches and double vision following spraying with 2,4-D. Although there are no reliable statistics on health effects, a survey of farmers and grain elevator operators in Saskatchewan where vast areas are sprayed (mainly with 2,4-D), indicated some possible trends. Twenty percent of 3,330 people surveyed responded that they had experienced ill effects from working with agricultural chemicals, 2,4-D apparently being the most troublesome. Symptoms were

generally confined to the season or time of spraying, and were similar among those affected. They included nausea, loss of appetite, weight loss, and occasional vomiting. A small number reported a skin rash. The symptoms observed one year were often more extreme than those observed in previous years. This report suggests the possible development of sensitivity to the spray with repeated exposure, especially if large continuous areas are sprayed(63).

A dermal exposure encountered by workers during aerial spraying could, in theory, reach the range of 2-6 mg/kg body weight application, assuming that one-half of the body was exposed. Epidemiological studies have not been conducted on the critical group, farmers and applicators, who may be exposed to these compounds, nor has the actual inhalation and dermal exposure that they encounter been defined. Thus, it is not possible to make an authoritative extrapolation from the effects observed in the laboratory to the field situation(64).

Any epidemiological study will have to consider the various combinations of solvents, emulsifiers, etc., used with these herbicides. It could not be determined whether illnesses reported by some farmers during the spraying season were due to the herbicides, to additives in the formulations, or to other causes. It should be noted, however, that symptoms of exposure to some petroleum solvents are similar to those noted above, such as skin reactions and nausea(65).

Manufacturers and applicators of these herbicides are the individuals most likely to receive the highest dose. One study reports that laborers involved in the manufacturing of 2,4-D were exposed to 20-40 mg/day (about 0.3-0.6 mg/kg-body weight per day) with no significant clinical effects(66).

Symptoms of 2,4-D poisoning such as fibrillary twitching and muscle paralysis have been reported following dermal exposure or ingestion (usually accidental) of large doses of 2,4-D. In a reported case of apparent suicide by ingestion of at least 6 g (at least 80 mg/kg) of 2,4-D, the compound was found in all organs and degeneration of nerve cells was reported, although this may have been caused by loss of appetite. Three cases of dermal exposure to an unidentified ester of 2,4-D are reported in which immediate symptoms of weakness and nausea were followed by at least several months of numbness and aching of feet and hands. Some paralysis persisted for several years. No mechanism of toxicity was proposed, but both motor and sensory nerves were affected(67).

It is reported that about 40 percent of a reindeer herd of 600 died in April and May, 1970, when they fed on coniferous vegetation which had been treated on July 12, 1969, with a mixture of 2,4-D (2 parts) and 2,4,5-T (1 part) at a rate of about 2.5 lb/acre. Also, 40 of the reindeer aborted their young. Analyses revealed that the coniferous leaves from the area during April and May

contained 25 ppm of 2,4-D and 10 ppm of 2,4,5-T⁽⁶⁸⁾. To what degree the 2,4-D component is responsible for the animal losses in this incident is not known. It is also not known if and how much TCDD impurity, if any, was in the 2,4,5-T component that was applied, or if there were any other factors involved which may have been responsible or contributed.

Animals killed by massive dosages of 2,4-D are believed to die of ventricular fibrillation (heart failure). Sublethal doses, single or repeated, lead to general unkept appearance without specific signs except a tenseness and muscular weakness. Feeding studies in animals indicate that repeated exposures to doses just slightly smaller than the single toxic dose are tolerated indicating little cumulative effect.

It has been estimated that the single oral dose required to produce symptoms in man is probably about 3-4 grams. Profound muscular weakness was noted in a patient recovering from an episode of acute poisoning by 2,4-D⁽⁶⁹⁾.

The available studies indicate that, in general, the phenoxy herbicides and their salts, esters, and amines as tested are of low or moderately low acute oral toxicity to mammals. Limited information suggests that dogs may be more susceptible to oral doses of 2,4-D and 2,4,5-T than are other tested species such as rats, mice, and guinea pigs. Short-term data tend to suggest a relatively low cumulative oral toxicity of the herbicide 2,4-D⁽⁷⁰⁾.

Since exposure to high concentrations of phenoxy herbicides as residues in food or water is relatively unlikely, the primary risk to human health may be expected to be from occupational exposure during manufacture and application⁽⁷¹⁾.

In evaluating the field toxicology of the phenoxy herbicides in terrestrial systems, it is apparent that direct toxicity to fauna and microorganisms is not generally expected to be a critical concern. Honeybees are a possible exception⁽⁷²⁾.

Application of the salt formulation of 2,4-D to lakes at rates of 1-4 kg hectare meter are not likely to have a direct effect on aquatic animals. However, there is evidence to indicate that if some ester formulations were applied to ponds, lakes, etc. at the same levels, certain aquatic organisms would be affected. The actual toxicity of individual esters and salts varies widely and must be assessed in terms of each specific situation⁽⁷³⁾.

a. Toxicity to bees and earthworms

No mortality occurred in earthworms when they were immersed for 2 hours in concentrations of 0.1, 1.0, 10.0, and 100 ppm of 2,4-D; but at 1,000 ppm 100-percent mortality occurred. 2,4-D at normal dosages did not affect the numbers of wireworms, springtails, mites, and other micro-arthropods in soil⁽⁷⁴⁾.

Researchers calculated the LD₅₀ of 2,4-D fed orally to honeybees at 104.5 microgram/bee; however, others reported an LD₅₀ of about 1/10 this level, or 11.525 microgram/bee. Treating fields in New Zealand for tansy ragwort control with 2,4-D at 3 lb/acre caused a 22-percent mortality in honeybees working the treated field. However, dusting bees with 2,4-D, did not cause any mortality. This raised the question as to whether the toxicity observed in the field was due to the 2,4-D dissolved in the nectar or to the production of a toxic metabolite secreted by the plant into the nectar⁽⁷⁵⁾.

b. Improved palatability of toxic plants

Concern has been expressed over the possibility that 2,4-D treated vegetation normally refused by animals may become more palatable, especially to livestock, and cause toxic effects or dietary insufficiencies. Tests with vegetation treated with 2,4-D (alkanolamine salt) as a 5 percent solution repelled cattle⁽⁷⁶⁾.

Cottontail rabbits given a choice of feeding on 2,4-D treated vegetation or untreated vegetation ate almost none of the treated vegetation⁽⁷⁷⁾. A browse improvement test in which the tops of trees were killed stimulating regrowth at the base indicated that deer showed no preference for either untreated or treated branch growth⁽⁷⁸⁾.

4. Risk assessment

Entry of 2,4-D from all its uses in agricultural and forestry into water used for human consumption does not appear to present any danger of health⁽⁷⁹⁾. Additional 2,4-D introduced into water by BPA's proposed right-of-way spraying program would be extremely small because it would distribute relatively minor amounts over a large geographic area. In the past, amounts of 2,4-D introduced into bodies of water during application, if detectable, are trace amounts persisting only for transitory periods with a negligible dose/exposure effect to aquatic inhabitants and users.

Human consumption of 2,4-D treated blackberries on a right-of-way could cause ingestion of approximately one mg/kg of body weight under the following worst conditions: (1) 2,4-D deposition rate of 6 lbs/acre without application losses; (2) all berries in full exposure with a surface area of 1/2 inch² and a weight of 3 grams each; (3) no herbicide breakdown by any cause following deposition on the berries; (4) consumption of one pound (450 grams) of berries by a 30 kg child. The dosage of approximately 1 mg 2,4-D/kg body weight represents only from 0.2 percent to 1.25 percent of the estimated human Acute Oral LD₅₀. Because 2,4-D is readily excreted without accumulating, there is a substantial margin of safety. Also, blackberries that have been treated with 2,4-D are not likely to appear palatable.

Human consumption of herbivorous game animals (such as deer) feeding in a 2,4-D treated right-of-way does not appear to be a potential route of significant 2,4-D intake either. Rapid excretion of this chemical and its breakdown in the body of the deer eliminates all but small residues from its system, especially the muscle tissue. Human consumption of domestic meat and dairy products would present even less significant 2,4-D exposure as label directed grazing restrictions and normal delays between withdrawal and slaughtering would minimize 2,4-D residues.

The use of 2,4-D on BPA's rights-of-way offers minimum hazard to man and his environment because the large and prolonged doses required to cause significant biological effects would not occur⁽⁸⁰⁾. The major impact from BPA's use of 2,4-D on its right-of-way system would be the loss of susceptible plants and the shelter and feed they provide for nondomestic animals.

(b) Dicamba

Dicamba, sold under the brandname Banvel, would be applied both by air and ground for noxious weed control and to control pest trees on rights-of-way and access roads. The products that would be used by BPA contain the active ingredient dicamba either as acid or as an amine salt. Dicamba is a growth regulating herbicide similar to 2,4-D, is readily absorbed by plants, and is translocated from either roots or foliage. Dicamba is considered to be low in volatility but high in water solubility; it is one of the more mobile herbicides. Dicamba affects a fairly broad spectrum of plants. However, grasses are normally quite tolerant of substantial dosages of dicamba.

Maximum dicamba application rates at BPA would be up to 2 lbs. active ingredient (A.I.) per acre. In nearly all cases dicamba would be used together with 2,4-D, with the latter being at twice the strength (4 lbs. A.I./acre). At the maximum rate of 2 lbs/acre, 21 milligrams (mg.) of dicamba are deposited per square foot of right-of-way surface (including all vegetation in that area).

1. Degradation in the environment

a. Persistence in soil

Dicamba appears to be broken down through photodecomposition when on the soil surface. Dicamba is also broken down by soil organisms, but less rapidly than 2,4-D. Dicamba is highly water soluble, in the acid form at 4,500 ppm and as the amine salt at 720,000 ppm. Dicamba is not readily adsorbed on inorganic soil particles. However, organic soil components adsorb dicamba readily. With its high water solubility dicamba will move readily from the soil surface and, especially in the absence of organic soil constituents, in the soil profile. Therefore, surface runoff of dicamba can only occur with extraordinary precipitation shortly after application.

Degradation in the soil by chemical and microbial action is most rapid when soils are at or near 80 percent field capacity and at temperatures between 25° to 35°C. Under these conditions breakdown of dicamba is complete within one to two months⁽⁸¹⁾.

A one pound A.I. per acre application of dicamba was found to exhibit sufficient phytotoxic soil activity for six months⁽⁸²⁾. A 1/2 lb/acre application rate on sandy loam soil was found to be still active three months following application. Under conditions of high soil moisture, 10 percent of the dicamba residue remained active four months after application. At a low soil moisture level, 70 to 90 percent of a 1 ppm initial soil residue level was still found in a silt loam after 9 months⁽⁸³⁾. Leaching occurring under high soil moisture may in part be responsible for greater residue decreases under those conditions⁽⁸⁴⁾.

b. Persistence in water

In water solution, breakdown of dicamba apparently occurs readily by photodecomposition. Stream monitoring following application lead some researchers to conclude that dicamba does not pose an acute hazard to aquatic organisms or downstream water users. Dicamba's short persistence in water precludes the possibility of chronic exposure. Aerial application of 1 pound of dicamba per acre to 165 acres of an 603 acre watershed in western Oregon was monitored on a stream draining the watershed for a 14-month period following the application. No dicamba residues were found later than 11 days following the application. With some of the water having undoubtedly moved through the soil profile following the application, dicamba uptake in the runoff was potentially high but not detected in the stream in later samples. Three sampling points at different distances from the point of watershed outflow produced the residue values depicted in Figure 7, indicating a most significant reduction of potential exposure to an aquatic inhabitant or water user through stream dilution⁽⁸⁵⁾.

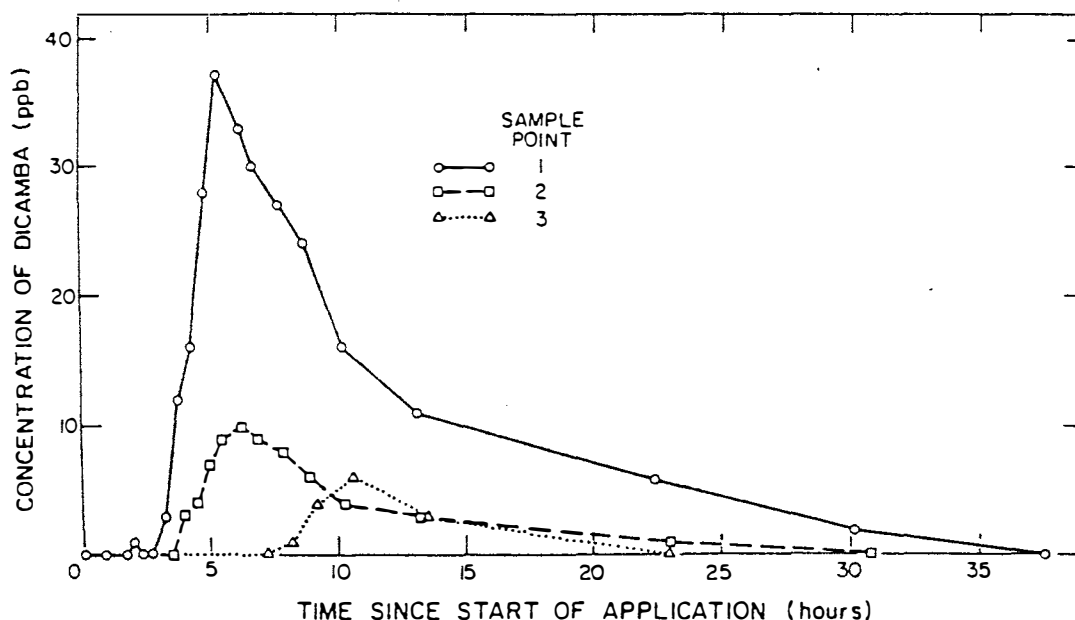


Figure 7. Concentration of dicamba in Farmer Creek after aerial application of 1.12 kg dicamba per ha to 67 ha of a 244-ha watershed.

Source: Logan Norris, "Dicamba Residues in Streams After Forest Spraying" Bulletin of Environmental Contamination and Toxicology, Vol. 13, No. 1 (1975).

Stream residue monitoring of dicamba applied by helicopter to one BPA right-of-way segment for the control of noxious weeds in western Washington in three successive years provided the following data: One-half pound of dicamba applied per acre in 1977 resulted in an 8 ppb peak approximately 30 hrs. following application dropping down to 1 ppb approximately 18 hrs. later. Approximately 2 weeks after application substantial precipitation caused an approximate 3 ppb transient dicamba peak to occur. No further residues were found. Visual examinations of the streamside buffer zone revealed that it had not been adequately maintained during application, apparently causing some herbicide entry. No dicamba residue was found in 1978 with a 1 lb./acre application rate. Visual examination of the streamside buffer zones showed that the 100 ft. specified distances had been adequately maintained during application. In 1979, another 1 lb./acre dicamba application to the same site resulted in a residue peaking approximately 4 hrs. following applications at approximately 3 ppb and then diminishing. Residues were no longer detectable 4 days following application. Visual examination suggested that a buffer zone had been maintained. Some minor losses of dicamba out of the immediate target area apparently occurred during the aerial application.

c. Persistence in vegetation

Dicamba is absorbed by both roots and leaves. Once inside the plant, the material is translocated in both the xylem and phloem. Dicamba residues remaining on the plant surfaces are removed by rain washing and/or by photo or chemical decomposition. Materials absorbed into the plant are in part exuded from its root system. Absorbed dicamba is also metabolized within the plant with the metabolites becoming herbicidally inactive. Remaining residues of dicamba found on the target plants are not persistent and decline rapidly from treated bluegrass and bermudagrass tested as shown in the following tabulation⁽⁸⁶⁾:

<u>Period After Treatment days</u>	<u>Dicamba (ppm) at rate/acre</u>		
	<u>2 lb.</u>	<u>5 lb.</u>	<u>10 lb.</u>
7	51.1	86.2	250.0
14	24.4	51.8	96.0
30	6.7	15.9	21.7
60	4.0	4.5	12.5

Application of .5 lb/acre dicamba on wheat (5 leaf stage) showed that residues declined from 63 ppm on the day of application to a nondetectable amount 28 days after treatment. In corn, no dicamba residues were detected at ensilage stage when 1 lb/acre had been applied preemergence. Postemergence, .25 lb/acre applied up to the time corn was 36 inches tall also yielded no residues at ensilage time⁽⁸⁷⁾.

2. Toxicity data

a. Acute toxicity - Oral

Research data on toxicity suggest that dicamba is only slightly toxic to humans, with an acute oral LD50 set at 1,040 mg/kg or between 1 ounce and 1 pound ingested by the average 150 lb. person for a 50 percent probability of lethal effect. This value is based on:

Oral LD50 Dicamba as (acid) - rats: 2740-2900 mg/kg
Oral LD50 Dicamba as (acid) - mouse: over 4640 mg/kg
Oral LD50 Dicamba as (amine salt) - rats: 1028 mg/kg
Oral LD50 Dicamba as (amine salt) - guinea pig: 566 mg/kg
Oral LD50 Dicamba as (amine salt) - rabbit: 566 mg/kg
Oral LD50 Dicamba + 2,4-D (1 lb + 2 lb/gal)-rat: 1960-2500 mg/kg

Source: Velsicol Chemical Corp., Banvel Environmental Impact Statement.

b. Subacute toxicity - Oral toxicity

Dicamba as the amine salt was fed for 13 weeks to male and female rats at the rate of 100, 500, 800, and 1,000 ppm of their diet. Food consumption and growth rate remained normal, no deaths occurred, and pathology at the end of 7 weeks was negative. At the end of 13 weeks, there were moderate effects noted in liver and kidney pathology at the 1,000 ppm level, and a very slight effect at the 800 ppm level. No effects were detected at or below the 500 ppm dietary levels(88).

Female rats were fed diets containing 658 to 23,500 ppm commercial dicamba for up to 24 days without effect on food intake, body weight, organ weight, or interference with normal metabolic function(89).

Lactating dairy cattle were fed dicamba at the rate of 10, 25, and 50 ppm of their diet. The milk showed no residue of dicamba. When the dosage was raised to 80 and 400 ppm of their diet, residues not exceeding .15 ppm were detected in the milk after 9 days of continuous feeding(90). At day 13, excretion in the urine ranged from 150-239 ppm. No adverse effect was noted in the dairy cattle in this study(91).

c. Dermal toxicity

The dimethylamine salt of dicamba (85 percent purity), administered undiluted as a 4 lb/gal concentrate to the skin of rabbits and rats, produced a very mild irritation when administered daily for 2 weeks. When diluted 1:40 in water, no irritation was observed even after 30 days. There was no evidence of systemic toxicity from absorption through the skin(92).

d. Inhalation toxicity

No evidence of toxicity due to inhalation has been noted. Like any other chemical, however, proper care should be used during application, especially when using dicamba in a granular form(93).

e. Eye irritation

Application of 0.1 ml of an undiluted 4 lb/gal concentrate of the dimethylamine salt of dicamba (89.7 percent) produced no injury to the cornea or iris of rabbits. Only a low grade irritation was noticed which disappeared quickly. The chemical caused no irritation or injury when administered as a 2 percent or 0.2 percent aqueous solution as a single dose or as repeated doses over a period of a week(94).

f. Chronic toxicity

Albino rats were fed for two years at levels of 0, 5, 50, 100, 250, and 500 ppm of technical grade dicamba in their diet. There were no observable or measurable effects on survival, body weight, food consumption, organ weight, and hematology of the treated animals⁽⁹⁵⁾.

Beagle dogs were fed continuously for two years on diets containing 0, 5, 25, and 50 ppm of technical grade dicamba and survived without signs of illness or effect on behavior. There were no observable or measurable effects upon the survival, body weight, food consumption, or organ weight of the test animals as compared to the control dogs⁽⁹⁶⁾.

g. Effects on reproduction -

Teratogenicity

Rats in a three generation reproduction study were fed diets containing dicamba at levels of 0, 50, 125, 250, and 500 ppm in their diet. No effect was detectable in the fertility, gestation, viability, or lactation indices of the parent or their offsprings when the second litter of each generation was used as an indicator. There was no evidence of teratology⁽⁹⁷⁾.

h. Neurotoxicity

No neurotoxic symptoms have been observed in studies to date⁽⁹⁸⁾.

i. Synergism

There were no synergistic effects in the studies of rats feeding on a diet containing 500 ppm dicamba⁽⁹⁹⁾.

j. Mutagenicity

Male albino mice were treated with a single dose of dicamba at levels of 500 or 1,000 mg/kg orally and by abdominal cavity injection at levels of 15 and 30 mg/kg. They were then mated to unbred females. Dicamba was found not be a mutagen in this test program. (100)

k. Carcinogenicity

No information is available.

l. Avian and fish toxicity

LD50 toxicity of dicamba based on testing was set at 673 mg/kg for domestic hens and at 800 mg/kg for pheasants⁽¹⁰¹⁾.

Lethal Concentration (LC)50 toxicity of dicamba to rainbow trout in 24 and 48 hour exposures was 35 ppm; in a 96 hour exposure the LC50 dropped to 28 ppm. For bluegills at 24 hours the LC50 was 130 ppm and at 96 hours it was 23 ppm. The dicamba concentration which would kill 50 percent of both fish species at 96 hours ranges between 23 and 130 ppm of dicamba⁽¹⁰²⁾. A study on small carp showed that at 24 hours the LC50 for the dimethyl/amine salt formulation was 659 ppm and at 58 hours 465 ppm⁽¹⁰³⁾. The median tolerance limits for juvenile coho salmon exposed to dicamba were 151 and 121 ppm active ingredient for 24 and 48 hours, respectively⁽¹⁰⁴⁾.

An investigation of particular interest to the Pacific Northwest were the effects of dicamba on seaward migration and saltwater adaption of anadromous fish species such as the coho salmon. In entering seawater an osmotic disturbance is caused by the necessary reversal of the salt and water retention/excretion mechanism in the fish which may be affected and, if severe enough, cause the demise of the fish. As shown in Table 7, dicamba did not appear to affect this osmoregulatory process. There is no explanation for the 32 percent mortality at the 0.25 ppm concentration⁽¹⁰⁵⁾.

TABLE 7
SURVIVAL OF YEARLING COHO SALMON EXPOSED TO DICAMBA IN FRESHWATER
AND SUBSEQUENT SURVIVAL FOLLOWING TRANSFER TO SEAWATER
(JAN. 6-23, 1977)

Concentration (mg/liter) ppm				Percent Survival ^{a/} (144-h exposure Freshwater)	Percent Survival (268-h Saltwater)
Nominal	Measured				
Control	0			100	100.0
0.25	0.19	-	0.22	100	64.8 ^{b/}
0.50	0.40	-	0.42	100	100.0
1.00	0.54	-	0.56	100	100.0
5.00	3.15	-	3.33	100	100.0
10.00	10.05	-	10.11	100	100.0
50.00	50.50	-	53.20	100	100.0
100.00	108.20	-	109.90	100	100.0

^{a/} Twenty fish exposed per concentration.

^{b/} No explanation for unusual mortality pattern.

Source: H.W. Lorz, et al, Effects of Selected Herbicides on Smolting of Coho Salmon (Environmental Protection Agency, 1979).

mammals

m. Metabolism and persistence in

Metabolic studies with radioactively traced dicamba administered to rats via food and oral intubation showed that essentially all of dicamba was excreted rapidly via the urine⁽¹⁰⁶⁾. When ingested by dogs also, dicamba was again rapidly excreted in the urine. About 88 percent of the dose was excreted unchanged with the remaining 12 percent excreted together with glycine⁽¹⁰⁷⁾. Vital organs and tissue samples from dairy animals which had grazed for 30 days on pasture plots treated with 5 and 10 lbs dicamba per acre were free of residue. No adverse effect was noted in the cattle⁽¹⁰⁸⁾. These findings suggest that ingested dicamba is not stored in animal tissue, especially the fatty portion, but cleared rather rapidly from the animal⁽¹⁰⁹⁾.

3. Risk assessment

At a maximum application rate of 2 lbs/acre at BPA approximately 21 mg/ft² of dicamba would be deposited in the target zone on the right-of-way. This amount precipitates and divides itself where applied over the overstory, understory, the herbs and grass, and the soil surface. Should this deposit rate be intercepted by a body of water 3 inches deep, it would cause an initial dicamba concentration of 3 ppm. Bodies of water supporting any kind of fish population are, of course, considerably deeper, and maintain some degree of flow or mixing characteristics which would greatly reduce aquatic concentration below this 3 ppm level. Actual residue studies previously reported strongly suggest that, with the maintenance of a buffer strip adjacent to bodies of water, only a minimal fraction of this theoretical 3 ppm value will manifest itself in the runoff for a short period of time. Documented toxicity values for fish previously discussed suggest the existence of a significant safety factor between actual exposure during application of dicamba and deleterious effect to aquatic inhabitants.

Mammals grazing in an area of vegetation treated with up to 2 lbs/acre of dicamba could conceivably have access to feed having an initial residue as high as 100 ppm (extrapolated from the residue rate of 51 ppm on bluegrass 7 days following application). A cow weighing 500 kg and consuming possibly as much as 30 kg of feed daily would result in an 6 mg/kg/day intake of dicamba. This dietary intake would represent considerably less than 1 percent of the acute oral LD50. Rapid removal of ingested dicamba would preclude buildup of any deleterious dosages in the animal (no bioaccumulation). Label directed grazing restriction following dicamba application further increases the safety factor until a significant portion of dicamba is lost off the treated or exposed grass available for intake by the cattle.

The risk of human exposure through milk or meat from cattle or other livestock grazing in exposed areas

would be small because of the extensive loss or breakdown of chemical in the body of the animal. Grazing restrictions in treated areas further decrease the hazard potential of an indirect human exposure to dicamba. Human consumption of foraging game animals which have grazed in a treated or exposed area will likewise cause only insignificant human uptake of dicamba because of the rapid loss of dicamba from the body of the game animal following exposure. Contaminated berries picked and consumed by humans, because of their relatively minute surface area, would cause an insignificantly small dietary intake of dicamba. There is no information suggesting a human health hazard in the proposed label directed use of dicamba on BPA's right-of-way and access road system.

Because of the low levels of potential contamination, entry of dicamba into the aquatic environment does not appear to present a hazard to its inhabitants. However, care should be taken to minimize the entry of dicamba into water because of its potential effect on a relatively broad spectrum of susceptible plant species which may be exposed to contaminated water. Entry of dicamba into irrigation water must be avoided as some crops are particularly sensitive to dicamba.

Appropriate drift control measures and suitable application techniques will greatly minimize any potential hazard to crops. Precautionary statements on the label must be adhered to to minimize undesirable exposures of any kind.

Nondomestic animals living in the target zone would be impacted through BPA's use of dicamba because of the loss of susceptible plants and the role they play in providing shelter and forage for them.

(c) Picloram

Picloram, sold under the trade names of Tordon and Amdon, is applied as a foliage spray by various delivery methods, injected into pest trees, or applied as pellets on the ground where it is leached into the root zone by rainfall. The greatest portion of Picloram used by BPA is in the product Tordon 101 containing one-half pound of picloram and two pounds of 2,4-D per gallon, both as amine salts. Picloram affects many broad-leaf plants and noxious weeds. Picloram does little or no harm to established grasses.

The maximum application rate for picloram in BPA's vegetation control program would be 2 pound of active ingredient per acre. Excepting the pellet application, all other uses at BPA would involve a combination of picloram together with 2,4-D, normally in a proportion of one part picloram with four parts 2,4-D.

Picloram is a readily translocated growth regulating type herbicide acting similarly to the phenoxy compounds. It accumulates in new growth. Water solubility of picloram is 430 ppm (milligram/liter). As the potassium salt, picloram is highly water

soluble (40 percent weight basis). The water solubility characteristics of picloram and its salts are one of the major factors governing its movement and persistence in the soil⁽¹¹⁰⁾.

1. Degradation in the environment

a. Persistence in soil

Picloram leaches readily from the soil surface into the soil profile, especially sandy soils with low organic content and high rainfall. Adsorption rates of picloram onto organic soil particles is high, confining most infiltration to the uppermost 12 inches. A high percentage is adsorbed in organic matter found in the upper 6 inches and in the layer of organic litter found frequently on rights-of-way. Adsorption to nonorganic soil components is relatively low. Vapor pressure of picloram is low thus volatility from the soil after application is also very low.

Picloram is readily degraded on the soil surface or in water solution when exposed to sunlight. Photo decomposition at the soil surface was found to be 15 percent after one week in sunlight⁽¹¹¹⁾. Microbial degradation of picloram in the soil is relatively slow as its chemical structure apparently is not an easily utilized energy source⁽¹¹²⁾. Typical conditions conducive to a substantial soil microorganism population favor picloram breakdown. In colder climates microbial breakdown rates will be much slower. Accelerated breakdown of picloram at higher soil temperatures has been found, however, information is incomplete.

Picloram half-life in soil as a result of all degradation mechanisms has been estimated to vary between 1 to 13 months⁽¹¹³⁾. Lower initial application rates of picloram were found to break down at rates faster than heavier application rates. Plots in California, South Dakota, Kansas, and Minnesota showed disappearance of picloram applied at rates of 1.4 to 4.2 pounds per acre ranging from 58 to 90 percent the first year and 78 to 100 percent the second year⁽¹¹⁴⁾. Picloram applied at a rate of .6 kg/ha (.5 lb/ac) and more in the fall declined to about 10 percent after 24 months and to less than 6 percent after 35 months⁽¹¹⁵⁾. Under low soil moisture conditions in another test, dissipation of picloram was found to be negligible with about 35 percent of the activity remaining after 2 years from two applications of .35 kg/ha (.31 lb/ac) each⁽¹¹⁶⁾.

Picloram residue on BPA right-of-way in the Cascade Range of Oregon at an elevation of 4,300 feet with an application rate of 1 lb/acre showed an 85 percent loss in the 0-3 inch soil profile and a 71 percent total loss in a 0-6 inch profile between 3 and 10 months following aerial application. Three repeated applications of picloram over a 6-year period to BPA right-of-way near the Oregon coast with a cumulative total of over 2 pounds/acre, showed an 80 percent loss in the 0-6 inch soil profile 7 months following the last application (.75 pound/acre). No residue was detectable

below 12 inches of soil depth indicating that soil residues of picloram were not building up from repeated applications.

b. Persistence in water

Picloram can enter water when an application is made directly into water surfaces or drift from the target zone is deposited onto water surfaces. Water entry of picloram may also occur due to surface runoff shortly after application, before the chemical infiltrates from the soil surface into the soil profile. The amount and intensity of rainfall, density of vegetation, slope of the land, and distance from the treated site all have a significant influence on the degree of picloram movement. Heavy runoffs which cause soil movement may remove picloram which has previously infiltrated into that soil and cause water contamination if the flow does not terminate prior to entry into a body of water.

Aerial application of 6 pounds 2,4-D and 1 pound of picloram per acre to a BPA right-of-way segment in the Cascade Range of Oregon caused a 15 ppb residue peak 30 minutes following application at a stream sampling site approximately 350 feet from the edge of the target zone. One hour later no picloram was detectable at a 3 ppb threshold of detection level. No subsequent picloram contamination was found at that site in daily testing for approximately 5 months and the final termination of this test site. Close examination of the target zone revealed that a 100 foot buffer strip had not been maintained during application and direct picloram entry into the stream had occurred. It is likely that maintenance of a buffer zone would have most significantly reduced the already low levels of herbicide found.

At a right-of-way site on the Oregon coast another aerial application of 1 lb/acre of picloram, with a detection threshold level of 2 ppb, no residues were found in stream runoff in daily monitoring over a period of 9 months following the application. During this period, 70 inches of precipitation were recorded in the area. Due to equipment malfunction, stream monitoring did not include the first 48 hours following the application. During this time some picloram runoff may have occurred. Well-defined buffer zones observed in the target zone, and no detectable herbicide contamination found beginning 48 hours after the application, suggest that amounts of herbicide entering the stream during this period, if at all, were quite small and of short duration only.

A number of other studies have similarly indicated that only small amounts of picloram are removed from the site of application in surface runoff(117). In another area where 67 percent of a watershed was sprayed in August with 0.5 lb/acre picloram together with some 2,4-D, residues up to a maximum of 78 ppb were detected after an initial 1 inch rainfall and they decreased thereafter. No residues were found after late October or where only a small portion of a watershed was treated. In a chaparral area in southern

California after an August application of 1, 2, and 4 pounds acid equivalent per acre of picloram, the first runoff water contained 0.1, 0.5, and more than 0.5 ppm of picloram respectively. After 15 inches of rain, residues had dropped to 0.01, 0.03, and 0.03 ppm of picloram⁽¹¹⁸⁾. In another test, picloram was applied at 1.1 kg/ha (.98 lb/acre) to plots at the head of a small stream, and water was collected at 0, 0.8, and 1.6 km downstream from the treated area for five months following application. Samples were also collected just downstream from the treated area following each rain. The highest concentration, 29 ppb was found in runoff water adjacent to the treated plots closely following the first runoff. Repeated sampling from the stream at various distances failed to show any picloram in the downstream water. Studies of picloram residues in streams have suggested rapid mixing of the runoff results in extensive dilution with negligible residues observed⁽¹¹⁹⁾.

Picloram levels in lakes have not generally been reported, but levels in farm ponds directly adjacent to plots treated at 1.1 kg/ha (.98 lb/acre) have reached 1 ppm. However, these high levels rapidly decreased to less than 10 ppb within 100 days. The residue levels have been observed to initially decline by 15 percent per day. After 14 weeks (approximately), the residues remained relatively constant, decreasing by less than 1 percent per day. The rapid decrease could be related either to mixing or to photochemical degradation and is probably a combination of the two factors⁽¹²⁰⁾.

An entire 16-acre hillside pasture watershed in southern Oregon was sprayed in June with 1 pound per acre picloram, including a dry stream channel. There was no water in the stream until October. The first two storms caused limited wetting of the stream channel and filled the pools, but caused no outflow from this gauged watershed. Maximum picloram concentration was about 0.1 ppm. The first water to flow from the watershed carried some picloram, but the concentration was low (20 ppb). No herbicide was detected after January. About 0.28 percent of the picloram applied to the watershed appeared in streamflow during the 3-year study. The dry stream channel accounts for 0.21 percent of the area of the watershed. The study concluded that the herbicide outflow largely represented mobilization of residues applied in and near the dry stream channel⁽¹²¹⁾.

c. Persistence in vegetation

When applied as foliage spray, the amount of picloram intercepted by vegetation foliage depends on the rate of application and the density of vegetation. The greatest portion of the intercepted chemical will remain in or on the foliage. Only a relatively small portion is translocated out of the treated leaves into other portions of the plant. Nevertheless, translocated amounts may be totally adequate to cause plant injury or death. The root systems of some plants may exude some translocated picloram into the soil⁽¹²²⁾. Much of the picloram not absorbed into the foliage will, through the

action of rain, be washed from the leaf surfaces and enter the soil profile. Some photodecomposition of picloram on the exposed foliage will occur. Loss of deciduous foliage in the fall likewise will remove picloram from a plant and transfer the chemical into the soil component. Picloram absorbed into the plant and distributed through its system may be degraded through metabolic activities of the plant to biologically inactive substances⁽¹²³⁾.

Forage grass treated with two pounds of picloram/acre resulted in a residue on the grass of 135 ppm at the time of application. Two weeks after application, residues on the grass had dropped to 32 ppm. After 52 weeks, grass residues had declined to 3 ppm⁽¹²⁴⁾. In another test, grasses treated with up to 2 pounds of picloram/acre contained an average of 2650 ppb 1 month after treatment. In 6 months this residue had dropped to 10 ppb⁽¹²⁵⁾.

With pelleted picloram material, plant residue levels are generally lower than those stemming from foliage applications. After application and entering the soil solution, picloram levels in the plant increase to a peak of approximately 20 ppm within about 8 weeks. They then begin to decrease slowly to less than detectable levels in approximately 1 year⁽¹²⁶⁾. This was found to hold true with pelleted picloram rates as high as 9 pounds per acre⁽¹²⁷⁾.

2. Toxicity data

a. Acute toxicity - Oral

Research data on toxicity suggests that picloram should be classified "Practically Nontoxic" with an acute oral LD50 set at 8200 mg/kg for humans. This means that it would take approximately 2.4 cups of pure picloram ingested at one time to cause a 50 percent mortality rate in people weighing 150 pounds. It is important to note however that inert ingredients in the formulation may exhibit toxicity which must be considered in the overall toxicity of the product. Toxicity of other herbicidal ingredients in the commercial picloram formulation must similarly be considered, such as in the product Tordon 101 which contains 2,4-D.

Oral LD50 picloram as acid - rat (f)	8200 mg/kg
Oral LD50 picloram as acid - mouse (f)	2000-4000 mg/kg
Oral LD50 picloram as acid - guinea pig (f)	apx 3000 mg/kg
Oral LD50 picloram as acid - rabbit	apx 2000 mg/kg
Oral LD50 picloram as acid - chicken (m)	apx 6000 mg/kg
Oral LD50 Tordon 101 - rat (f)	3800 mg/kg

(Source: G. E. Lynn, A Review of Toxicological Information on Tordon Herbicides, Dow Chemical Co.)

b. Subacute toxicity - Oral

Picloram was fed to male and female albino rats at a rate of 75 mg/kg for a period of 90 days without any apparent ill effects. Two calves were fed picloram at the rate of 72 and 154 mg/kg for 31 days without any ill effects. 6.8 oz. of Tordon 101 formulation equivalent to 1265 mg/kg was fed to calves without any apparent ill effects. With sheep, 1.7 oz. of Tordon 101 (the equivalent of 1900 mg/kg) showed no ill effects. At this rate, cattle were showing toxic effects but no deaths were reported⁽¹²⁸⁾.

c. Dermal toxicity

Picloram applied undiluted to the skin of rabbits for 9 days caused only slight exfoliation and hyperemia. Skin of other rabbits exposed for several days to various concentrations of picloram showed no severe or prolonged effects. The dermal LD50 for picloram was found to be greater than 4000 mg/kg for rabbits. Application of Tordon 101 at 2000 mg/kg to rabbit skin caused slight hyperemia and slight necrosis⁽¹²⁹⁾.

d. Inhalation toxicity

Albino rats were exposed to a saturated atmosphere of the potassium salt of picloram for seven hours. No adverse effects were observed during or for 2 weeks after exposure⁽¹³⁰⁾.

e. Eye irritation

Undiluted picloram applied to the eyes of albino rabbits produced slight to moderate conjunctival redness or conjunctivitis. Signs of eye irritation disappeared in 1 to 7 days. With application of the undiluted potassium salt of picloram in addition, slight corneal cloudiness appeared but all signs of irritation or injury subsided in 1 to 2 days⁽¹³¹⁾.

f. Chronic toxicity

Albino rats and beagle dogs were fed picloram at rates of 15 to 150 mg/kg of body weight for 2 years. No observable adverse effects were noted in either species as measured by body weight, food consumption, behavior, mortality, hematological and clinical blood chemistry studies, and urine analysis⁽¹³²⁾.

g. Effects on Reproduction and Teratogenicity

Albino rats fed picloram at various levels in the diet up to 3000 ppm through 3 generations exhibited no adverse effects in fertility, gestation, viability, and lactation by body weight records and by teratological examinations of the fetuses.

Mice fed at 100 ppm for 4 days before and 14 days after mating produced the same number of offspring before and after the test⁽¹³³⁾.

h. Carcinogenicity

Rats were fed 10,000 and 20,000 ppm picloram in their diet for 39 weeks, 5,000 and 10,000 ppm for 41 weeks, then none for 33 weeks. Survivors were autopsied revealing an increased incidence of tumors, renal disease, and atrophy of the testes in the treatment group. In a similar study, mice were fed 5,000 and 10,000 ppm picloram in their diet for one week, 2,500 and 5,000 ppm for 79 weeks, then none for 10 weeks. Autopsies revealed an increased incidence of spleen tumors and atrophy of the testes in the treatment group. In another study, rats were fed 15, 20, and 150 mg/kg body weight picloram in their diet for 2 years with no difference in the incidence of tumors in treatment and control groups. In a study with dogs, beagles were fed 15, 50, and 150 mg/kg body weight Tordon in their diet for 2 years. Giving limited information, the study concluded that no pathological changes were noted. This data suggests that picloram, with extended exposure to large doses, is carcinogenic to rats and mice⁽¹³⁴⁾.

i. Avian and fish toxicity

Picloram fed at rates of 100 to 1,000 ppm of the daily diet of Japanese quail and mallard ducks was insufficient to obtain an oral LD50. Japanese quail similarly fed 100 to 1,000 ppm of picloram in their diet for three successive generations did not have an effect on mortality, body weight gain, egg production, fertility, or hatchability, and without post-treatment symptoms⁽¹³⁵⁾.

Five species of fish were exposed to a Tordon 101 mixture containing amine salts of picloram and 2,4-D in the ratio of 1:4 for various periods of time between 24 and 96 hours. At the 24-hour exposure rate the LC50 for goldfish, fathead and pugnose minnow, green sunfish, brook, brown, and rainbow trout varied between a combined acid equivalent (picloram + 2,4-D) of 20 to 65 ppm. At the 96-hour exposure rate, the LC50 for the same species under the same test conditions varied from 17.4 to 62 ppm. These results should be reviewed in the context that with a 3 lb/acre uniform application rate to a body of water only 3 inches deep the maximum concentration would not exceed 4.5 ppm⁽¹³⁶⁾.

Yearling coho salmon exposed to Tordon 101 exhibited a 24-hour LC50 of 20 ppm (combined acid equivalent picloram + 2,4-D) with an apparent mortality curve becoming rather steep at that point. Survival rates of coho salmon upon entering salt water appears to be little affected by 144 hour exposure to Tordon 101 concentration of 0.29 to 19.8 ppm in fresh water. A 75 percent mortality of coho salmon in salt water exposure following fresh water Tordon 101 exposure at the 0.29 to 0.62 ppm level in the tests conducted could not be explained, since heavier exposures up to 19.8 ppm did not seem to reduce survival rates⁽¹³⁷⁾.

In a 16-day exposure experiment with yearling coho salmon, Tordon 101 exposure up to approximately 1.35 ppm did not seem to affect salt water survival. Seaward migration of coho salmon was affected only slightly by Tordon 101 exposure to 1.8 ppm for 15 days (approximately 10 percent difference)(138).

j. Metabolism and Persistence in

Mammals

Dogs fed a diet containing 97 ppm of radioactively tagged picloram excreted 90 percent of the dose unchanged in the urine within 2 days following feeding. Picloram did not appear to accumulate in the animal tissue. Sheep fed a grain supplement diet containing 220 ppm of picloram for one week showed a maximum blood level of 0.25 ppm which fell to 0.01 ppm or less within 96 hours after cessation of the picloram containing diet. Urine residues dropped in the same period from a maximum level of 350 to 880 ppm, to less than 1 to 52 ppm(139). Based on other investigations (e.g., Fisher 1965), it was concluded that mammals excrete unchanged approximately 98 percent of the picloram intake via the kidneys prior to significant breakdown by the animal liver(140).

In milk and meat studies, dairy cows were fed up to 18 mg/kg/day or the equivalent of 10 to 1,000 ppm of their food intake. Less than 50 ppb were found at 1- to 2-week exposures with up to 100 ppm feed intake. Three hundred to one thousand ppm feed levels produced average residues of 50 ppb and 190 ppb during a 2 week exposure. Two to three days following removal from the 1000 ppm diet milk residues became undetectable (less than 20 ppb).

Steers fed for 2 weeks a diet containing 200 to 1,600 ppm picloram or the equivalent to 2.6 to 23 mg/kg/day produced a maximum residue of 0.3 ppm in the muscle and fat with up to 18 ppm in the kidneys. All tissue residues dropped to less than .1 ppm, including the kidneys of the animals at 1,600 ppm, within three days after withdrawal as shown in figure 8. This further suggests that picloram does not accumulate or concentrate in mammals feeding on picloram-treated vegetation. Cessation of exposure will result in essentially complete elimination of picloram within several days(141).

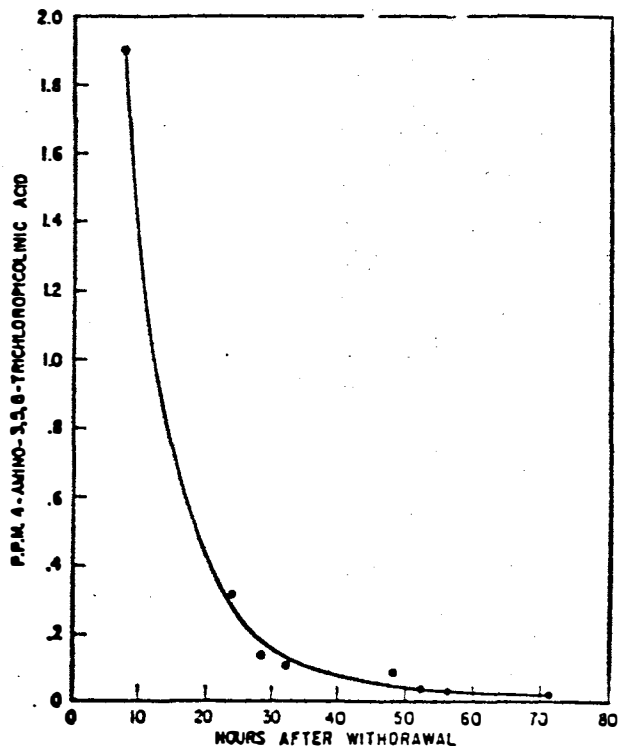


Figure 8. Disappearance of 4-amino-3,5,6-trichloropicolinic acid (picloram) from blood of steer (1600 ppm fed) after withdrawal from diet.

Source: National Research Council of Canada, Picloram: The Effects of Its Use as a Herbicide on Environmental Quality.

k. Bioconcentration in Aquatic

Environment

Residue analyses of aquatic organisms exposed to picloram indicate that this herbicide is similarly not bioconcentrated in invertebrates or along food chains. *Daphnia* exposed to 1 mg/l of the potassium salt of picloram had whole body residues of the herbicides equal to that present in the water. Bioconcentration of picloram (acid) was not evident in mosquito fish exposed to 1 mg/l (acid equivalent) for 18 days. The concentration factor for these fish on a wet weight, whole body basis, was only 0.02. The 18 days of exposure to picloram was adequate to achieve a steady state level of accumulation in the mosquito fish⁽¹⁴²⁾.

3. Risk assessment

At a maximum application rate of 2 gallons/acre of Tordon 101, one pound of picloram will be deposited

per acre, or approximately 10 mg/ft² of right-of-way surface, including the overstory, understory, and the soil surface. At the same rate, total deposit of the spray into a body of water 3 inches deep would cause an initial 1.5 ppm picloram residue. Bodies of water normally supporting a fish population are, of course, considerably deeper and maintain some flow or mixing characteristics which would considerably reduce this residue rate.

Feed intake of mammals grazing in an area of forage grass treated with 1 pound of picloram per acre would be consuming approximately 75 ppm of picloram in their feed. With a daily feed intake possibly as high as 30 kg for a large cow weighing 500 kg, the daily picloram intake would be approximately 4.5 mg/kg/day. Even if the entire feed intake would come from a treated area as used in the calculation above, the ingested amount would be only a minute fraction of the demonstrated no effect levels. Chronic exposure potential of the animal to picloram is small as daily excretion losses is virtually equal to amounts ingested daily.

There does not appear to be a toxicity hazard to human consumption of meat and dairy products (including game) which has fed in picloram-treated areas because excretion of ingested picloram is rapid and essentially complete. The potential for human dietary intake of meat or milk from animals grazing on treated areas will be reduced even further by adhering to grazing restrictions for beef and dairy cattle. Documentation of general toxicity to humans because of picloram exposure is lacking in the literature.

Limited entry of picloram into the aquatic environment does not present a hazard to its inhabitants. Entry into water can be minimized by adherence to effective buffer zones around bodies of water and other measures such as drift control techniques to confine the released chemical to the target zone. Phytotoxic strength of picloram may present a hazard to sensitive vegetation having access to contaminated water. Entry of picloram into irrigation water is especially critical because some crops, such as potatoes, exhibit an extremely high sensitivity to picloram and thus could be severely injured. Precautionary label statements and use restrictions reflect this phytotoxic potential of picloram should it not be used judiciously; they do not reflect any significant or unusual hazard to humans or animals. The major impact from BPA's use of picloram on its right-of-way system would be the loss of susceptible plants and the role they play in providing ground cover and shelter and feed for animals.

(d) Herbicides used at substations and minor right-of-way use herbicides

This part covers first the herbicides used for total vegetation control in fenced substation facilities and minor herbicide use for weed control in ornamental plantings around these facilities. With essentially all application sites being inaccessible to animals and the general public, and the chemicals being dispensed

manually or by ground equipment with practically no application losses out of the target area, potentially significant exposure of higher forms of life is remote. As previously discussed, the hazard potential of a herbicide with a low degree of exposure is very low.

The second group of herbicides discussed in this segment are those materials which would be used in minor quantities throughout the right-of-way system for control of both woody and herbaceous vegetation. With their toxic properties less or not exceeding the other herbicides (picloram, dicamba, and 2,4-D) discussed in detail, the hazard potential because of their low use rate is not significant. For this reason discussion of these herbicides is brief.

1. Prometone

By itself or in combination with other herbicides prometone is sold under a number of different tradenames. BPA would use prometone in two different formulations in FY 1981: Ureabor, containing 5 percent prometone with a total use of approximately 5,000 lbs and Pramitol 25E at 25 percent prometone concentration (approximately 2 lbs./gal.) with a total use of approximately 1,300 lbs.

All prometone would be used in fenced substations for total vegetation control around energized equipment. The prometone used at BPA would be applied in pellet form in Ureabor by hand and power spreaders, and in liquid form by low pressure sprayers.

Acute oral toxicity to rats is 2,980 mg/kg; for mice it was found to be 2,160 mg/kg. Other acute toxicity tests with quail, mallard ducks, goldfish, and rainbow trout demonstrated equally low toxicity of prometone to these species. In subacute studies, rats were dosed with 400 mg/kg for 6 out of 7 days for 4 weeks. All animals survived the treatment⁽¹⁴³⁾. The acute LD50 for a 150 lb. person is estimated to be about 4/5 of a cupful⁽¹⁴⁴⁾.

Prometone is non-volatile and has a medium water solubility. Prometone is rather readily adsorbed by soil, especially soil with a high organic content. A relatively persistent chemical in the soil, Prometone shows phytotoxic effects for several years. Microbial breakdown is a major route of disappearance from the environment⁽¹⁴⁵⁾.

BPA's use of prometone, because of low exposure potential in fenced substation yards and prometone's relatively low toxicity, is not a hazard to humans and animals.

2. Bromacil

Bromacil is sold as a liquid and wettable powder under the trade name Hyvar. Together with equal parts of diuron it is sold as Krovar. Bromacil can also be found as a minor active ingredient in a basically borate/chlorate mixture known as

Ureabor which BPA would use exclusively for total vegetation control in substation yards. BPA's total use of bromacil would be less than 2000 lbs for FY 1981.

Acute oral toxicity of bromacil to laboratory animals was found to be 5200 mg/kg⁽¹⁴⁶⁾. Bromacil was also found relatively nontoxic via dermal exposure. It may be moderately irritating to eyes, nose, throat, and skin, but there are no reports of induction or skin sensitization⁽¹⁴⁷⁾. In 2-year chronic toxicity studies the dietary no-effect level for rats was found to be 250 ppm; for dogs, 1240 ppm. Bromacil is relatively nontoxic to birds; it is slightly to moderately toxic to fish⁽¹⁴⁸⁾.

With bromacil being applied directly to the ground either in granular form or under low pressure in a water carrier, uptake of the chemical by animals and humans following the application is insignificant and rather improbable, especially in fenced substation yards where access is restricted. Bromacil's use by BPA would not present a hazard to humans, animals, and nontarget vegetation under normal use conditions.

3. Borates and Chlorates

Sodium Metaborate and Sodium Chlorate mixtures are sold under a variety of trade names. Pramitol 5 PS and Ureabor are the two products used by BPA containing 90 and 96.5 percent borate/chlorate ingredients respectively. At BPA, the exclusive use of borates and chlorates would be in fenced substation facilities to control all vegetation in and around energized equipment. BPA proposes to use a total of approximately 200,000 pounds of borates/chlorates throughout its entire system in FY 1981.

Acute oral toxicity of sodium chlorate is 5000 mg/kg for rats. Chronic toxicity has not been reported. Sodium chlorate is a potent oxidizer and may cause irritation of skin, eyes, and mucous membranes. The salty taste of this material may make it attractive to salt hungry animals and thus encourage uptake if accessible^(149, 150). Sodium metaborate has an acute oral toxicity of 2330 mg/kg for rats and is a moderate skin irritant.

Borate/chlorate mixtures are applied by hand or power spreaders in granular form to the ground in the fall or spring (depending on location). Subsequent precipitation will move these highly water soluble chemicals from the soil surface into the soil profile. With relatively coarse textured soils and high precipitation rates, some of the chlorates and borates may enter an unusually shallow water table.

Inadvertent human and animal exposure to the applied materials is highly improbable because of inaccessibility of the fenced treatment area and the infiltration of the chemical into the soil profile. Possibility of exposure of humans and animals to

ground water containing borates and chlorates appears to be remote or inconsequential because of high dilution rates expected in groundwater. Because of its low exposure potential, BPA's use of borates and chlorates would not be a hazard to humans and animals.

4. Ammonium sulfamate

Ammonium sulfamate sold under the trade name "Ammate X" with and without sodium dichromate corrosion inhibitor would be used at some selected right-of-way locations for stump treatment of pest trees either in a water carrier or used dry in the crystalline form. Considerably less than 500 pounds of ammonium sulfamate would be used throughout the entire BPA system in FY 1981.

Acute oral toxicity of this herbicide is very low: for rats it has been found to be 3900 mg/kg. Chronic feeding studies on rats at 10,000 ppm of diet for 105 days produced no clinical signs of toxicity nor histological changes⁽¹⁵¹⁾. Deer fed foliage of various tree species treated with ammonium sulfamate and with the straight chemical ad libitum experienced some weight loss. No signs of sickness were noted⁽¹⁵²⁾. Toxicity to fish was found to be low, a 5 ppm concentration did not show toxic signs to rainbow trout in a 24 hour exposure. The LC 50 to fingerling catfish was in excess of 200 ppm⁽¹⁵³⁾.

Ammonium sulfamate without the corrosion inhibitor is approved by the Environmental Protection Agency for use around public water supply areas. Ammonium sulfamate residues on apples and pears up to 5 ppm are permitted.

Ammonium sulfamate use at BPA does not present a hazard to humans, animals, and nontarget vegetation under normal use conditions because of extremely low toxicity and very limited use and exposure.

5. Atrazine

Atrazine, sold under the tradename of Aatrex, would be applied onto the soil surface for total vegetation control in a number of small substations located in agricultural areas where no herbicide movement from the treated area can be tolerated. This consideration takes into account infrequent occurrences of heavy rainfall which may lead to surface runoff.

Less than 300 pounds total of Atrazine would be applied in a water carrier to a number of substations throughout the BPA system. Acute oral toxicity of Atrazine was found to be 1750 mg/kg for mice and 3,080 mg/kg for rats. Chronic oral toxicity, inhalation, and dermal toxicity was found to be of no significance⁽¹⁵⁴⁾.

Atrazine's use at BPA would not present a hazard to humans and animals because of its very limited use and the extraordinary low probability of any exposure.

6. 2,4-DP

2,4-DP, also known as dichlorophenoxypropionic acid or dichlorprop (a member of the phenoxy family of herbicides closely related to 2,4-D) would be used by BPA for control of pest woody vegetation on its right-of-way system. Less than 150 pounds of 2,4-DP is proposed for use together with equal parts of 2,4-D in a formulation marketed under the tradename Weedone 170. All 2,4-DP would be applied by ground equipment as foliage spray in a water carrier, or as basal or stump treatment with an oil carrier via a low-pressure low-volume sprayer.

Acute oral toxicity of 2,4-DP for mice is 400 mg/kg and for rats 800 mg/kg, thus very similar to 2,4-D(155). Ninety day feeding studies with 2,4-DP on rats showed a no-effect level at 12.4 mg per day (31 mg/kg)(156), somewhat higher than the no-effect level for 2,4-D under similar conditions(157). 2,4-DP fed at the 10 and 28 mg/kg level from day 7 to 18 months to two strains of mice did not increase the incidence of tumors,(158). A 2.4 percent 2,4-DP solution did not irritate skin, and a 1 percent solution was not an eye irritant(159).

Comparative soil persistence studies showed 2,4-DP to have a somewhat longer halflife than 2,4-D (10 days vs. 4 days) (160). Persistence and toxicological data suggest that 2,4-DP use by BPA would be similar to 2,4-D in its degree of presence or absence of hazard to humans and animals. For details on 2,4-D please refer to the previous discussion of that chemical.

7. Dichlobenil

Dichlobenil, sold under the tradename of Casaron, would be soil applied for weed control in ornamental plantings around a number of substations. Less than 500 pounds of this product would be used systemwide in FY 1981.

No adverse effects on wildlife were noticed in the tests for the herbicide evaluation of dichlobenil, and the observed toxicity for mammals makes such effects on wildlife mammals improbable. Also, dichlobenil is not acutely toxic to fish at herbicidal concentrations(161). Therefore, application of Casaron at BPA does not present a hazard to humans and animals.

8. Monuron and diuron

Monuron and diuron, sold under the tradenames of Telvar, CMU, and Karmex, would both be used for herbaceous and grass control around wood pole structures and in substations.

Diuron is also formulated together with Bromacil in a proprietary product called Krovar. Less than 2,000 pounds of both monuron and diuron would be used throughout the BPA system. Application of both materials would be in a water carrier to the soil surface. Both chemicals belong to the substituted ureas and differ only by an extra chlorine atom in the diuron which makes the latter somewhat less water soluble.

Acute oral toxicity for both materials is between 3,400-3,600 mg/kg for rats. Monuron and diuron both have a low order of chronic toxicity. Skin tests on guinea pigs with aqueous pastes of monuron and diuron produced no irritation of intact or abraded skin and produced no sensitization⁽¹⁶²⁾.

It does not appear that BPA use of either monuron or diuron would present a hazard to humans, animals, and nontarget vegetation under normal use conditions.

C. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS SHOULD THE PROPOSAL BE IMPLEMENTED

The unavoidable impacts to natural resources and land uses as a result of the Fiscal Year 1981 proposed construction and maintenance program are summarized below:

- permanent removal of all vegetative cover from approximately 246-259 acres (98-104 ha) as a result of the construction of the new substations, transmission lines, and permanent access roads.
- introduction of combustion byproducts into the atmosphere as a result of open burning of slash from clearing forest land.
- removal of up to 1,163-1,644 acres (465-658 ha) of forest land from timber production, costing 6-7 annual jobs in the forest industry and 12-14 service jobs.
- removal of up to 22-25 acres (9-10 ha) of cropland from production, to be occupied by tower footings and substations.
- alteration of existing wildlife habitat which could result in locally decreased wildlife populations.
- temporary impacts to fisheries and aquatic organisms in the waterways or tributary streams that would be crossed during construction.
- permanent visual impacts to scenic resources.
- temporarily accelerated soil erosion attributable to the clearing, construction, and maintenance activities involved in the proposed program.

- local residents would be likely annoyed by noise, induced electrical currents, and trespassing.
- potential hazards to bird flights.
- slight local degradation of water quality, especially at stream crossings, with potential adverse impacts to fisheries.
- control of tall-growing vegetation on rights-of-way.
- reduction of vegetative cover on approximately 18,646 acres (7,544 ha) of existing right-of-way and 780 acres (316 ha) of existing substation property.
- introduction of herbicides into the Pacific Northwest environment as a result of vegetation control by aerial and ground application.

D. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The high voltage facilities proposed for construction have an expected average useful life of 50 years for transmission lines with steel or concrete supporting towers and for associated substations. Wood-pole lines have an expected useful life of 35 years.

Some of the environmental consequences associated with creation of the facility can be considered short term. These are primarily associated with construction activity itself, and vary in duration. Construction activity interferes with the use of the land within the corridor while construction is underway (generally 3 months to 2 years for a specific location), and may also result in a disturbance to nearby wildlife and residents because of noise, dust, and visibility of workers and equipment. Some construction impacts may also extend for a short term beyond the actual construction period. These are principally associated with the disturbance of vegetation by construction activities. Included among these are changes of habitat for certain wildlife species within the corridor, increased erosion, and resultant siltation, and they generally end with the regrowth of natural or introduced vegetation.

The long-term impacts on the environment and productivity, including the increased productivity of other activities resulting from the availability of electric energy, are directly dependent on continued existence of the transmission facility itself. The productivity resulting from the use of the electricity provided by new facilities will be substantially the same over the life of the facility. Similarly, the adverse effects on productivity, which are primarily related to land use considerations, will last as long as the facility remains in place.

If changes in technology make a transmission line obsolete, it can be dismantled and removed, although experience in past years indicates that corridors are usually upgraded to higher capacity as technology advances, rather than being entirely removed from service. Retirement would permit substantial return of the area to its natural state (vegetative reversion may take several years), which will terminate any adverse impact on land and its productivity directly created by the line, and would also terminate the benefits to productivity resulting from the availability of the power provided. Retirement and removal of the line would make the corridor available for a full range of land uses. However, if adjacent land use patterns (at the time of dismantling) have been modified by the existence of the line, the economic uses of the corridor may continue to be limited after removal of the line. No other direct long-term impacts to productivity have been identified.

E. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction and maintenance of facilities included in the Fiscal Year 1981 Proposed Program will require clearing and disposal of approximately 1,163-1,644 acres (465-658 ha) of timber from forested land. This land will be committed to other uses such as agriculture, range, or recreation for the life of the transmission facilities, or it may be used only by wildlife. If the new transmission facilities are eventually retired, a return to the original forested state will be possible. This would take approximately 20 to 50 years, depending upon location, although tree growth will begin to provide substantial ground cover after about 5 years. In addition, approximately 22-25 acres (9-10 ha) of agricultural land will be occupied by new towers and substations which represent relatively permanent uses of the land.

Soil lost as a result of increased erosion during construction and maintenance operations will be irretrievably lost.

In addition to the commitment of land resources, approximately 14,400-14,800 tons (13,090-13,450 metric tons) of steel and 6,500-6,700 tons (5,910-6,090 metric tons) of aluminum required for the manufacture of the tower structures and conductor will be irreversibly committed to transmission uses*. If any of this equipment should later be retired, materials used in their construction can normally be reused elsewhere or recycled.

Fossil fuels power the internal combustion engines of vehicles, aircraft, and other machines. Manual methods of vegetation control, while not utilizing powered equipment, would consume energy for the vehicular transportation of laborers to work sites. The use of herbicides for vegetation control would consume energy in manufacturing the

(*) These figures are based upon average conditions. The actual design of individual facilities will depend upon topography, soil characteristics, meteorological conditions, and the tower configurations utilized.

chemicals, transporting workers, and aerial application. The most energy efficient method of vegetation control depends on the distance of the site from a work center, access, vegetation density, and the area of the site to be treated.

During the life of the facilities certain uses of the right-of-way land will be restricted, limiting the range of beneficial uses of these lands. The principal limitation will result from the restriction of large structures from the rights-of-way. This limits the use of the rights-of-way as sites for residential, commercial, industrial, and agricultural buildings. Because of the linear nature of a transmission line right-of-way, other suitable lands are generally available nearby.

Also, certain types of agricultural activities, such as wheel and circular irrigation, dependent on large areas of unobstructed access, may be affected. In areas where these activities are practiced, construction of the proposed facilities may necessitate adjustments in crop layout to obtain optimal use of the land and small portions of a holding may, in some cases, become uneconomic to farm. Where these situations occur, the landowner will be compensated.

LIST OF PREPARERS

V. LIST OF PREPARERS

A. MICHAEL W. BERG, SENIOR ENVIRONMENTAL SPECIALIST

Two years teaching Political Science and Political Economy at Mt. Angel College, Mt. Angel, Oregon. Worked in Oregon State Governor's Office during 1973/1974 administering State Emergency Set Aside Program for Middle Distillate Fuels. Since 1974 has been working for BPA in preparing, processing, and managing EIS's on BPA's construction and maintenance activities, as well as developing agency guidelines and procedures.

Educational Background:

BA - University of California, Los Angeles - Political Science
MA - University of California, Los Angeles - Political Science
Additional postgraduate work in economics

B. ERWIN BERGMAN, ENGINEERING TECHNICIAN

Fifteen years working for BPA in vegetation management and herbicide testing and use. Since 1970 has conducted BPA's herbicide residue monitoring program.

Educational Background:

AEE - Oregon Technical Insitute

C. GARY C. INSLEY, FORESTER

Three years working for U.S. Forest Service, Regions 4 and 5, doing timber inventory, sales administration, and resource development.

Educational Background:

BS - University of Minnesota, College of Forestry - Forest Resources Development

D. JAMES M. KEHOE, ENVIRONMENTAL SPECILAIST

One year project planning (EIS work) for architectural engineering firm of Daniels, Mann, Johnson, & Mendenhall. Since 1974 has been working as a location and reconnaissance engineer and environmental specialist for BPA.

Educational Background:

BS - Portland State University - Physical Geography
Graduate work - postgraduate studies at Portland State University

E. NEIL C. KIERULFF, MECHANICAL ENGINEER

Twelve years working for BPA (eleven years in substation design and one year in thermal power resource planning).

Educational Background:

BSMA - California State Polytechnic - Mechanical
Engineering

F. JACK M. LEE, BIOLOGICAL STUDIES COORDINATOR

Seasonal Ranger/Naturalist - Yellowstone National Park. Since 1973 has been working in EIS preparation and conducting environmental research for BPA.

Educational Background:

BS - Oregon State University - Wildlife Science
MS - Virginia Polytechnic - Wildlife Management

G. THOMAS C. MCKINNEY, ENVIRONMENTAL SPECIALIST

Two years experience working for the U.S. Forest Service as a Forestry Technician concentrating in such areas as fuels management, timber management, and Young Adult Conservation Corps. Since 1979 has been working for BPA in preparing, processing, and managing EIS's on BPA's construction and maintenance activities, as well as developing agency guidelines and procedures.

Educational Background:

BA - California State University, Fullerton - Geography

H. GEOFFREY B. MOORMAN, ECONOMIST

From 1969 to 1978 worked with BPA's Planning Office. Since 1978 has been working as an Economist with BPA's Energy Conservation Section.

Educational Background:

BA - Economics
Graduate work - Economics and Public Administration

**AGENCIES, ORGANIZATIONS, AND PERSONS
RECEIVING COPIES OF THE STATEMENT**

VI. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE
STATEMENT ARE SENT

*Comment received.

Federal Agencies

Advisory Council on Historic Preservation
Federal Energy Regulatory Commission
Federal Regional Council, Region X
Tennessee Valley Authority
U.S. Army Corps of Engineers*
U.S. Department of Agriculture
 Forest Service*
 Clearwater National Forest, Orofino, Idaho
 Flathead National Forest, Kalispell, Montana*
 Idaho Panhandle National Forest, Coeur d'Alene, Idaho
 Kootenai National Forest, Libby, Montana
 Lolo National Forest, Missoula, Montana
 Soil Conservation Service*
U.S. Department of Energy
 Western Area Power Administration
U.S. Department of Health, Education, & Welfare
 Public Health Service*
U.S. Department of Housing and Urban Development*
U.S. Department of the Interior
 Bureau of Indian Affairs
 Bureau of Land Management
 Bureau of Mines
 Fish & Wildlife Service
 Heritage Conservation & Recreation Service
 Interagency Archeological Service
 National Parks Service
 Office of the Secretary, Pacific Northwest Region*
 Water & Power Resources Service
U.S. Department of Transportation
 Federal Aviation Administration*
U.S. Environmental Protection Agency*

State Agencies

Idaho State Clearinghouse
Montana Department of Community Affairs
Montana Department of Natural Resource and Conservation
Montana State Clearinghouse
Oregon Department of Energy
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Forestry*
Oregon Department of Transportation*
Oregon State Clearinghouse*
Washington Department of Ecology*

State Agencies (Continued)

Washington Department of Fish and Game
Washington Energy Office*
Washington Office of Community Development
Washington State Clearinghouse

State Historic Preservation Offices

Idaho Historical Society
Idaho State University Museum
Montana Historical Society*
Oregon Museum of Natural History
Oregon State Historic Preservation Office
University of Idaho, Department of Sociology/Anthropology
University of Montana, Department of Anthropology
Washington Archeological Research Center
Washington Office of Archaeology and Historic Preservation

Local Agencies

Idaho

Bingham County
Bonner County
Bonneville County
Boundary County
Cassia County
Clearwater County
Clearwater Economic Development Association
East Central Idaho Planning and Development Association
Elmore County
Gem County
Ida-Ore Regional Planning and Development Association
Idaho Public Utilities Commission
Kootenai County
Latah County
Minidoka County
Nez Perce County
Panhandle Area Council
Region IV Development Association
Shoshone County
Southeast Idaho Council of Governments
Teton County

Montana

Anaconda-Deer Lodge County
Butte-Silver Bow County
Deer Lodge City-County
Flathead County Areawide Planning Organization
Granite County

Montana (Continued)

Lake County
Lincoln County
Mineral County
Missoula Planning Office
Powell County
Sanders County

Oregon

Benton County
Birkenfeld-Mist Citizens' Public Advisory Committee,
Rainier, Oregon*
Blue Mountain Intergovernmental Council
Central Oregon Intergovernmental Council
City of Rainier*
City of Wilsonville
Clackamas County
Clatskanie PUD
Clatskanie-Quincy Citizens' Public Advisory Committee,
Clatskanie, Oregon
Clatsop-Tillamook Intergovernmental Council
Columbia County*
Columbia Region Association of Governments
Coos County
Coos-Curry Council of Governments
Curry County
Deschutes County
District 4 Council of Governments
Douglas County
East Central Oregon Association of Counties
Environmental Council*
Executive Department*
Gilliam County
Harney County
Hood River County
Intergovernmental Relations Division*
Jefferson County
Klamath County
Klamath Lake Planning and Coordinating Council
Lane Council of Governments
Lane County
Lincoln County
Linn County
Marion County
Metropolitan Service District
Mid-Columbia Economic Development District
Mid-Willamette Valley Council of Governments
Multnomah County
Multnomah County Planning & Building Department
Polk County

Oregon (Continued)

Rainier-Fernhill Citizens' Public Advisory Committee,
Rainier, Oregon
St. Helens-Columbia City Citizens' Public Advisory Committee,
St. Helens, Oregon
Scappoose-Spitzenberg Citizens' Public Advisory Committee,
Scappoose, Oregon
Sherman County
Southeast Oregon Council of Governments
Tide Creek Citizens' Public Advisory Committee, Rainier, Oregon
Tillamook County
Tillamook County Court House
Umatilla County
Umpqua Regional Council of Governments
Union County
Upper Nehalem Valley Citizens' Public Advisory Committee,
Vernonia, Oregon
Wasco County
*Washington County
Wheeler County
Yamhill County
*Washington County Administration Office
Washington County Office & Planning Committee

Washington

Adams County
Asotin County
Benton County
Benton-Franklin Governmental Conference
Chelan County
Chelan County Regional Planning Council
Clallam County
Clallam County Governmental Conference
Clark County
Clark County PUD
Columbia County
Cowlitz County*
Cowlitz-Wahkiakum Governmental Conference
Department of Community Development, Kelso, Washington
Douglas County
Douglas County Regional Planning Commission
Energy Office*
Franklin County
Garfield County
Grant County
Grant-Lincoln-Adams County Conference of Governments
Grays Harbor
Grays Harbor Regional Planning Commission
Jefferson County
Jefferson-Port Townsend Regional Council

Washington (Continued)

King County
Kitsap County
Kittitas County
Kittitas County Conference of Governments
Klickitat County
Klickitat Regional Council
Lewis County
Lewis Regional Planning Commission
Lincoln County
Mason County
Mason Regional Planning Council
Office of the Governor
Okanogan Cities and County Regional Planning Council
Okanogan County
Pacific County
Pacific County Regional Planning Council
Pend Oreille County
Pierce County*
Puget Sound Council of Governments*
Regional Planning Council of Clark County*
San Juan County
San Juan County Planning Department
Skagit County
Skagit Regional Planning Council
Skamania County
Skamania Regional Planning Council*
Snohomish County
Spokane County
Spokane Regional Planning Conference
Stevens County
Thurston County
Thurston Regional Planning Council
TRICO Economic Development District
Wahkiakum County
Walla Walla Regional Planning Commissioner
Whatcom County
Whatcom County Council of Governments
Whitman County
Whitman County Regional Planning Council
Yakima County
Yakima County Conference of Governments

Wyoming

Lincoln County

Interest Groups

Friends of the Earth, Washington, D.C.*
Oak Ridge National Laboratory, Oak Ridge, Tennessee

Idaho

Clearwater Conservation Forum
Energy and Mass Environment
Idaho Citizens Coalition
Idaho Wildlife Federation
Kootenai Environmental Alliance
League of Women Voters
Lost Rivers - Lemhi Range Wilderness Council
Pacific Northwest Conservation Council
Sawtelle Chapter of Outdoors Unlimited
Soil Conservation Society of America
Wilderness Society
Wildlife Resources, Inc.
Wildlife Society

Montana

Environmental Information Center
Environmental Library, University of Montana
Flathead Citizens for Safe Energy
Montana Wilderness Association
Sierra Club,
 Missoula
 Upper Missouri Group
Western Environmental Trade Association

Oregon

Central Cascades Conservation Council
Clatsop Environmental Council
Columbia River Fisherman's Protective Union
Columbia River Gorge Commission
Consumer Power League
Crown Zellerback, Corp.
Energy Conservation Coalition
Eugene Future Power Committee
1000 Friends of Oregon
Greenpeace Foundation
Healthy Environment Action League
Izaak Walton League
League of Women Voters
Mid-Columbia Concerned Citizens
National Audubon Society
National Wildlife Federation
Nature Conservancy
New American Movement
Northwest Coalition for Alternatives to Pesticides
Oregon Common Cause
Oregon Environmental Council*
Oregon League of Environmental Voters
Oregon Shore Conservation Coalition

Oregon (Continued)

Oregon Wildlife Federation
Royal Oak Properties, Hillsboro
Sierra Club,
 Mary's Peak Group
 Portland, Oregon
 Rogue Group
Survival Center, University of Oregon
Trojan Decommissioning Alliance
Western Forestry and Conservation Association
Wilderness Society

Washington

Audubon Society
Citizens Against Toxic Herbicides
Citizens' Awareness of Pesticides
Ecotope Group
Federation of Western Outdoor Clubs
Friends of the Earth
Huxley College of Environmental Studies
Inland Empire Big Game Council
International Paper Company
Kelso Church of the Nazarene
League of Women Voters
Longview Daily News
North Cascades Conservation Council
Olympic Conservation Council
Pacific Marine Environmental Laboratory
Pacific Northwest Labs
Pierce County Action
Puget Sound Chapter of the Oceanic Society
Recreational Equipment Incorporated
Richland Ecology Commission
Sierra Club,
 Puget Sound Group
 Rattlesnake Hills Group
 Yakima River Group
Soil Conservation Society of America
Stop Toxic Overspray of Pesticides
Washington Environmental Council
Washington Forest Protection Association
Washington State Sportsmen's Council, Inc.
Western Environmental Trade Association

Environmental Defense Centers

Environmental Affairs Group, Atlanta, GA
Environmental Defense Fund
Environmental Law Committee of Young Lawyer's Section of
 Seattle-King County Bar Association

Environmental Defense Centers (Continued)

Natural Resources Defense Council
Northwest Environmental Defense Center
Northwest Fund for the Environment

Student Interest Groups

Center for Urban Affairs, Northwestern University,
Evanston, Illinois
Colorado State University, Fort Collins, Colorado
Environmental Affairs Commission, University of Washington
Idaho State University Outdoor Program
Institute for Environmental Studies, University of Washington
Oregon State University Environmental Center
Oregon Student Public Interest Research Group
Shorewood High School, Seattle, Washington

Others

Atomic Industrial Forum, Inc.
Battelle Pacific NW Laboratories
Bechtel Power Corporation
Clearwater Economic Development Association
Columbia County School District*
Columbia County Small Woodlands Association*
Confederated Tribes of the Colville Reservation
Confederated Tribes of the Umatilla Reservation
Connell, Metcalf and Eddy, Coral Gables, FL
Council of Energy Resources Tribes
Cowlitz County PUD*
Crown Zellerbach Corporation, Vernonia, OR
Doub & Muntzing, Washington, D.C.
Energy Impact Associates, Pittsburgh, PA
Energy Resources Conservation & Development Commission,
Sacramento, CA
Envirosphere Company, New York, NY
Government Secretariat, Hong Kong
Interdevelopment
Kootenai Tribe of Idaho
Ladner Environmental
Leeds, Hill and Jewett, Inc.
Longview International Paper Company
Pacific Power & Light Co.
Peter-Billy Glen Tree Farm, Inc.*
Portland Apartment Data Center
Portland General Electric Company
Portland Metropolitan Service District*
Portland Writing & Communications
Reese Brothers
T. Baker Smith & Son, Inc.
Spokane Tribe of Indians

Others (Continued)

W. Oregon Electric Cooperative, Inc.
Wilkinson, Cragun & Barker Law Offices
Willdan Associates

Individuals

Mr. Hubert Adkings, Rainier, OR
Sue, Dorothy and Ivan Archibald, Rainier, OR
Mr. Garland Brown, Rainier, OR
Mr. and Mrs. Bill Chun, Portland, OR
Catherine Davis, Rainier, OR
Mr. Max W. Dillard, St. Helens, OR
Mr. and Mrs. Larry B. Embley, Longview, WA
Robert K. Erickson, Scappoose, OR*
Mr. and Mrs. Bill Everman, Rainier, OR
Jan Fredeen, Rainier, OR
Mr. and Mrs. Paul Giepel, Rainier, OR
Mr. and Mrs. Dana Gnann, Rainier, OR
Robert and Jean Godier, Troutsdale, OR
Caroline Goodall, Hillsboro, OR
Senator Charles Hanlon, Cornelius, OR
Mr. John Hufsmith, Hillsboro, OR
Brantley Jackson, Pullman, WA
Mr. and Mrs. Dennis Jones, Rainier, OR
Rodney and Donna Kellar, Rainier, OR
Mr. Wes Kimble, Rainier, OR
Mr. and Mrs. A. F. Kittrell, Hillsboro, OR
Mrs. Wendy Mortenson, Portland, OR
Judge Brent NEvin, Vancouver, WA
Roger and Lynn Nichols, Rainier, OR*
Mr. and Mrs. Don Nys, Rainier, OR
Mr. Timothy M. O'Callaghan, Portland, OR
Donald Parcher, Rainier, OR
Harvey L. Parcher, Rainier, OR
Shirley Paulsen, Rainier, OR
Mr. Herman Pellham, Rainier, OR
Mr. and Mrs. John Peterson, Deer Island, OR
Dr. Robert Prins, Portland, OR
Mr. and Mrs. John Rauch, Rainier, OR
Mr. John E. Riehl, Rainier, OR
Mr. Jim Rombach, Rainier, OR
Mrs. Marion Sahagion, Scappoose, OR
Mrs. Alvin Schmale, Boring, OR
Mr. Ed Scott, Rainier, OR
Mr. John Scott, Rainier, OR
Christian Spies, Syracuse, NY
Mr. Scott Stafne,
Mrs. Hazel Stevens, Eagle Creek, OR
Mr. Joe Uris, Portland, OR
Kay C. VanNatta, Rainier, OR*

Individuals (Continued)

Mrs. Betty Vilhaur, Rainier, OR*
Mr. Bruce Wallace, Rainier, OR
Natalie Walsh, Helena, MT
John Wiener, Laramie, WY
Mr. and Mrs. Jim Windham, Deer Island, OR
Mr. K. L. Worthington, Rainier, OR
Fred Yost, Washington, D.C.

INDEX

VII. SUBJECT INDEX

- Agriculture II-5; III-1,2,3; IV-5, 6,28,71,73,74
Air quality II-5; III-1; IV-13 to 15,71
Aquatic resources IV-21 to 24
Archaeologic resources IV-9 to 11
Atmosphere IV-13 to 15,71

Bees II-15; IV-47,48
Biomass II-12
Biosphere IV-15 to 20
Birds II-6; IV-19,20,26,27,63,72

Coastal zones IV-3
Cogeneration II-12
Conservation I-1,3; II-7,8,9; IV-1

Delay II-6
Direct current transmission II-9,10

Electrical hazards IV-11,12,20
Electromagnetic fields II-5; IV-12,13
Electrostatic fields II-5; IV-12,13
Endangered species III-2; IV-15
Environment, affected III
Environmental consequences II-3,5,6, 15,16,17; IV
Erosion II-6,10; IV-6,25,26,71, 72,73

Farmland, prime and unique III-2; IV-6
Fisheries II-6; IV-16 to 18,26,71
Floodplains III-1; IV-21
Forests II-5; III-2; IV-3,19

Grazing II-5,16; III-2; IV-3,6,48, 56,57,66

Health effects, risk of II-16; IV-13,27 to 71
Herbicides II-14 to 18; IV-27 to 71,72
Historic resources IV-9 to 11
Hunting IV-18,20
Hydrosphere IV-20 to 24

Irrigation II-5; III-3; IV-5

Land Use II-3,5,10,18; IV-3 to 9, 71,73,74

Lithosphere IV-24,25
Load, projected I-1; II-7
Load-center generation II-11

Mineral resources IV-25

Navigable waters IV-23
Noise II-5; IV-15, 72
Nonconstruction II-7

Paralleling II-3; IV-1,16
Polychlorinated biphenyls (PCBs) IV-26

Range (see Grazing)
Recreation III-1; IV-8,9,26
Residential impacts II-5,11,13; IV-4,25
River and Harbor Act IV-23
Rivers, Wild and Scenic IV-22,23

Scenery IV-8,9,71
Sedimentation III-1; IV-17,18, 21,26
Silviculture III-3; IV-7,8,19,71
Socioeconomic resources IV-1 to 13
Soils II-6,15; IV-14,25,33,36,37, 38,39,40,49,50,58,59,71
Substations I-3; II-1,17; IV-3, 7,15,16,66,67,68,70,71,72

Underground conducting II-10
Upgrading II-3; IV-1
Urban impacts II-5,10; IV-4

Vegetation
 clearing II-1,6,10; IV-7,16,18, 19,71
 disposal II-1,5,13,15; IV-13 to 15,71
 management I-3; II-13 to 18; IV-7,16,18,26 to 71

Water
 quality II-6,13,15; III-1; IV-20,21,24,26,41,42,50,51, 59,60,69,72
 quantity IV-20,21
Wetlands III-1; IV-22
Wildlife II-5,6,15; III-1,2; IV-14,16,18 to 20,26,27,71,73



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VIII. REFERENCES

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COMMENTS RECEIVED ON THE DRAFT
FISCAL YEAR 1981 PROGRAM STATEMENT

INDEX OF COMMENT LETTERS

Proposed Fiscal Year 1981 Program

<u>PAGE</u>	<u>INDIVIDUAL/ORGANIZATION</u>	<u>DATED</u>
1	Oregon State Clearinghouse	Dec 07, 1979
2	Montana Historical Society	Dec 12, 1979
3	Puget Sound Council of Governments	Dec 19, 1979
4	Metropolitan Service District of Portland	Dec 20, 1979
5	Friends of the Earth, Washington, D.C.	Dec 19, 1979
7	Peter-Billy Glen Tree Farm, Inc.	Jan 22, 1980
9	Columbia County Planning Department	Jan 22, 1980
12	U.S. Dept. of Agriculture	Jan 22, 1980
13	Columbia County School District No. 13	Jan 21, 1980
15	Dept. of Transportation, Salem, Oregon	Jan 22, 1980
17	U.S. Dept. of the Interior, Portland, Oregon	Jan 25, 1980
23	Office of State Forester, Salem, Oregon	Jan 25, 1980
25	Dept. of Health, Education and Welfare Atlanta, Georgia	Jan 23, 1980
27	Dept. of Health, Education and Welfare Atlanta, Georgia	Feb 22, 1980
28	Dept. of Housing and Urban Development Seattle, Washington	Jan 28, 1980
29	Kay C. VanNatta, Rainier, Oregon	Jan 24, 1980
31	Robert K. Erickson, Scappoose, Oregon	Jan 28, 1980
32	City of Rainier, Oregon	Jan 28, 1980
34	Cowlitz County PUD	Jan 24, 1980
36	Dept. of Ecology, Olympia, Washington	Jan 25, 1980
38	Pierce County Planning Dept., Tacoma, Washington	Jan 28, 1980
39	Skamania Regional Planning Council Stevenson, Washington	Jan 24, 1980
40	Oregon Environmental Council	Jan 30, 1980
43	Cowlitz County Dept. of Community Development	Jan 29, 1980
46	Oregon Executive Department	Jan 30, 1980
47	Oregon Fish & Wildlife Dept.	Jan 18, 1980
49	Oregon Parks Dept.	Jan 02, 1980
53	Oregon Forestry Dept.	Jan 18, 1980
56	Metropolitan Service District, Portland, Oregon	Jan 29, 1980
58	MSD, Clackamas County	Dec 28, 1980
59	Columbia County Small Woodlands Assoc.	Jan 30, 1980
60	Dept. of Transportation, FAA, Seattle, Washington	Jan 31, 1980
61	U.S. Environmental Protection Agency Seattle, Washington	Feb 01, 1980
62	U.S. Dept. of Agriculture, Forest Service	Feb 04, 1980
64	Washington State Energy Office	Feb 01, 1980

INDEX OF COMMENT LETTERS, cont

Proposed Fiscal Year 1981 Program

<u>PAGE</u>	<u>INDIVIDUAL/ORGANIZATION</u>	<u>DATED</u>
65	U.S. Dept. of Agriculture, Forest Service Ogden, Utah	Jan 31, 1980
66	U.S. Dept. of Agriculture, Forest Service Kalispell, Montana	Feb 08, 1980
67	Regional Planning Council of Clark County	Feb 08, 1980
69	Dept. of the Army, COE, Portland, Oregon	Feb 15, 1980
70	Columbia County Board of Commissioners St. Helens, Oregon	Feb 13, 1980
71	Birkenfeld-Mist Citizens Public Advisory Committee	Feb 29, 1980



OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

STATE CLEARINGHOUSE

Intergovernmental Relations Division
Room 306, State Library Building
Salem, OR. 97310, Phone: 378-3732
Toll Free Number--1-800-452-7813

PROJECT ACKNOWLEDGEMENT

APPLICANT: BPA
PROJECT TITLE: 1981 Pgm BPA
DATE RECEIVED: December 7, 1979
PNRS #:

Your project has been assigned the file title and number that appear above. Use this reference in all future correspondence regarding this project.

- ☐ Initial 30-day State Clearinghouse review of your Notice of Intent began on the above date.
- ☐ The 30-day State Clearinghouse review of your final application began on the above date.
- ☐ Initial 30-day State Clearinghouse review of this HUD Housing project began on the above date.
- ☐ Initial 30-day State Clearinghouse review of your Direct Federal Development project began on the above date.
- ☐ The 30-day State Clearinghouse review of your final Environmental Impact Statement began on the above date.
- ☒ Initial 45-day State Clearinghouse review of your draft Environmental Impact Statement began on the above date.
- ☐ The 45-day State Clearinghouse review of your State Plan/Amendment began on the above date.

Your project must also be submitted to the affected area-wide clearinghouses for review.

If you have questions or need assistance, contact the State Clearinghouse at the above address and telephone number.



MONTANA HISTORICAL SOCIETY

HISTORIC PRESERVATION OFFICE

225 NORTH ROBERTS STREET • (406) 449-4584 • HELENA, MONTANA 59601

December 12, 1979

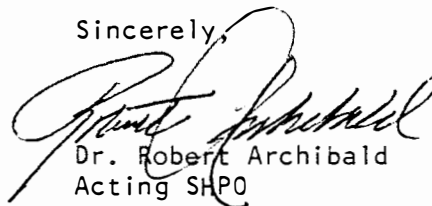
Environmental Manager
Bonneville Power Administration
Box 3621-SJ
Portland, Oregon 97208

Dear Sir:

Your Draft Environmental Impact Statement, Proposed Fiscal Year 1981 Program publication dated September 1979 indicates your knowledge of and familiarity with Section 106 of the National Historic Preservation Act of 1966, Executive Order 11593, and the Advisory Council on Historic Preservation Regulations at 36CFR800. If you proceed according to the steps outlined on pages 45, 46, and 47 you will have complied with the federal requirements.

I look forward to consulting with you on your Montana undertakings.

Sincerely,



Dr. Robert Archibald
Acting SHPO

RA/TF/prb

December 19, 1979

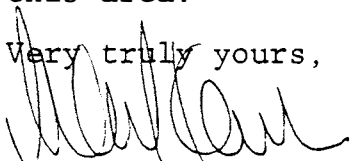
John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621-SJ
Portland, Oregon 97208

RE: DEIS - FY 1981 Program

Dear Mr. Kiley:

Thank you for the opportunity to review the draft EIS on BPA's proposed FY 1981 program. Since the program does not include projects that would affect our region, we have no comments at this time. We will look forward to reviewing draft environmental impact statement on the individual projects proposed in future years in this area.

Very truly yours,



Mart Kask
Executive Director

Metropolitan Service District

527 SW Hall Portland, Oregon 97201 503/221-1646

December 20, 1979

Rick Gustafson,
Executive Officer

Environmental Manager
Bonneville Power Administration
P.O. Box 3621 - SJ
Portland, Oregon 97208

MSD Council

Mike Burton,
Presiding Officer
District 12

Dear Sir:

Donna Stuhr,
Deputy Presiding
Officer
District 1

Re: Areawide Clearinghouse Review
BPA DEIS FY '81 Program
Metro File #7912-4

Charles Williamson
District 2

Craig Berkman
District 3

We hereby request an extension to the review period for the BPA DEIS to provide sufficient time for our Council to complete its review.

Corky Kirkpatrick
District 4

Jack Deines
District 5

We hope the requested extension will not cause undue inconvenience.

Jane Rhodes
District 6

Betty Schedeen
District 7

Sincerely,

Caroline Miller
District 8

Cindy Banzer
District 9

Gene Peterson
District 10

Denton U. Kent
Chief Administrative Officer

Marge Kafoury
District 11

DUK:MCH:ss
6412/D4

FRIENDS OF THE EARTH

530 7TH STREET, S.E., WASHINGTON, D.C. 20003
(202) 543-4313

DAVID BROWER, *Chairman of the Board*

December 19, 1979

Asst. Admin:	
Asst. COMM. OFFICIAL	FILE COPY
Asst. to the Dir.	Date
DEC 26 1979	
Referred To:	
Action Taken:	
EDWIN M. MATTHEWS	By: <input type="checkbox"/> ANS. <input type="checkbox"/> NO REPLY.
	Date

Mr. Ray Foleen
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Foleen:

I have read your report, "Draft Environmental Impact Statement, Bonneville Power Administration" Proposed Fiscal Year, 1981 Program, September 1979.

On page 49 of the report, it is stated: "The herbicides listed by BPA and listed in Table 4 or very low in toxicity to animals and humans." I looked at Table 4, and all the herbicides noted are poisons and in fact produce very serious health effects at doses used.

Package on Health Effects of 2,4-D and Picloram

We have had complaints from several parts of the nation about how exposure to 2,4-D caused people to lose their babies. This fits well with laboratory data, showing that 2,4-D causes bleeding both in the adult human and also in all the organs of the fetus.

Furthermore, picloram has been found to be a solid cancer causing chemical, with severe impact upon many body organs, as you can see from the enclosed study by Dr. Melvin Reuber of the Frederick Cancer Research Center (part of NIH).

We hope that you can revise this section to accurately reflect what is known about these chemicals. For example, the U.S. Forest Service presently believes that 2,4-D is so dangerous that they have issued new regulations to curtail its use. Secondly, Forest Service managers believe that picloram "is a really tough chemical". A lot of people are injured by it.

Aerial Application of Herbicides

You know as well as I that it is impossible to apply herbicides from the air without trespassing upon property owners all along the right-of-way.

This trespass situation has gotten so bad in some states such as West Virginia that drastic changes in the regulations have been adopted by the Public Service Commission. They have thousands of victims in West Virginia from powerline aerial spray.

Committed to the preservation, restoration, and rational use of the ecosphere

Bonneville Power has a lot of victims too. Unfortunately, I have had to represent them.

I would like to request that you halt all aerial spray of herbicides on your right of ways. We have petitioned the Federal Aviation Administration and the Environmental Protection Agency to do just this, but we hope that you will be responsive to the situation so that it does not have to be forced on you.

Integrated Weed Management

As you may know, selective brush management is less expensive than herbicide spraying, reducing annual costs by about 75 percent.

Bonneville Power could help utilities across the nation, as a federal agency, to develop better vegetation methods that cost less money than spraying.

I am enclosing a paper on what can be done with selective brush management. I can locate some experts for you if you cannot manage it yourself.

The President's Environmental Message of 1979

The President in his message of 1979 stressed integrated pest management, and directed agencies to develop programs. I think that your environmental impact is basically a slap in the face to the President, since it contemplates ignoring what can be done to save money with selective brush management.

We urge you to reconsider your program, and rewrite your statement to at least bring it up to the present standard of programs of the U.S. Forest Service. If you can't meet their standards, you are running a very poor show indeed. For starters, you need much better control over your herbicide program.

With best regards,



Erik Jansson

c. Secretary Duncan
c. CEQ

Tillamook, Oregon
January 22, 1980

Mr. John Kelley, Environmental Manager
Bonneville Power Administration
P. O. Box 3621-SJ
Portland, Oregon 97208

Dear Sir:

I am writing to you in regard to the subject Draft Environmental Impact Statement, BPA, Proposed Fiscal Year 1981, Printed September 1979.

My concerns are the proposed routes for the new construction from Alston-Keller Substations.

The present line runs directly through the middle of our Tree Farm, from the south 1/4 corner to the north 1/4 corner. We own all of Sec. 4 T4N-R3W-W. M.

This right-of-way is 200 feet wide and a mile long. This land is neutralized forever. There is too much land being taken out of timber production in this area by projects of this nature.

Columbia County is recognized as the finest Douglas Fir growing area in the Douglas Fir region. This is not only my opinion, but that of foresters in general.

We have owned and managed our tree farm for forty years. It was the first tree farm certified by the American Forestry Association in Columbia County and it has made continuing log production to the forest industries of the area.

None of we timber land owners can afford the luxury of the neutralization of more of our lands. It's time for better utilization of present rights-of-ways, even to the stacking of lines which you are doing in other areas.

I vigorously oppose any additional widths of rights-of-ways through this area.

Respectfully,

Glen F. Hawkins, President
Peter-Billy Glen Tree Farm, Inc.
5310 Netarts Highway
Tillamook, Oregon 97141

Ph: 503-842-6136

GH/lb
Copies:

Sen. Mark Hatfield
Sen. Robert Packwood
Rep. Al Ullman
Rep. Les AuCoin
Rep. Jim Weaver
Rep. Bob Duncan
Mr. Kay VanNatta

Tillamook, Oregon
January 22, 1980

Mr. John Kelley, Environmental Manager
Bonneville Power Administration
P. O. Box 3621-SJ
Portland, Oregon 97208

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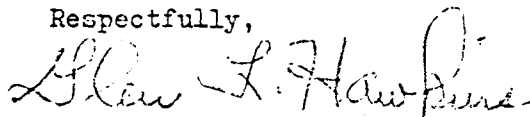
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UNITED STATES DEPARTMENT OF THE INTERIOR - BONNEVILLE POWER ADMINISTRATION
CONFERENCE AND TELEPHONE CALL REPORT

Date January 22, 1980

TO: Jack Kiley - SJ
~~Office of the Administrator~~

cc: ☐ John Hooson - EHA
☐ Vern Williams - ETM
☐
☐
☐
☐
☐

FROM: Robert J. Gilbert - OPE

Include all telephone calls and conferences of importance bearing upon policies, customer or public relations, but excluding those purely technical in nature.

☐ Official File - OPE

OUTSIDE CALLER OR CONFEREES

SUMMARY OF DISCUSSION

Larry Conrad, Sr. Planner
Columbia County Planning Department
Court House
St. Helens, Oregon
Phone 397-1501

Subject: Allston/Portland Area Service

Larry and I discussed the above subject on January 21. He pointed out that they noticed our newspaper ad for the public meeting, which prompted them to request a copy of our Fiscal Year 1981 Environmental Impact Statement. He suggested that in the future we send our EIS to the Planning staff, since it was necessary for him to call BPA and request the FY-1981 EIS.

They have two comments on the subject EIS:

- (1) Their calculations indicate that if BPA were to establish a new corridor through the county, it would permanently remove approximately 900 acres of forest land.
- (2) They are concerned over the impact of placing a steel tower within Hudson Park in the City of Rainier.

During our January 17th public meeting in Rainier, the audience inquired about future public input to the subject project. My response was that we may have additional public involvement in the EIS. I stated that we brought this message back to BPA for consideration.

During the public meeting, County Commissioner Marion Sahagian expressed concern over the short time frame (January 31, 1980) for comments. We will extend this deadline to the C-PAC's (Citizens' Public Advisory Committees) until February 15, 1980.

Earlier in the telephone conversation, I visited with a secretary in the office of the Columbia County Planning Director, Bryan Christian. Sonja gave us the following information on the status of the seven C-PAC's within Columbia County:

(1) Clatskanie-Quincy C-PAC:

Chairman: Richard Larsen, P. O. Box 306, Clatskanie 97016. Committee will meet the last Wednesday or Thursday of January. Election will be held, but Mr. Mr. Larsen will still be with the group, so it will be OK to address material to him.

CONFERENCE AND TELEPHONE CALL REPORT

Date Jan. 22, 1980

TO: Jack Kiley
~~Office of the Assistant Secretary~~cc: ☐
☐
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☐
☐
☐
☐

Page 2

FROM: R. J. Gilbert

Include all telephone calls and conferences of importance bearing upon policies, customer or public relations, but excluding those purely technical in nature.

OUTSIDE CALLER OR CONFERE

SUMMARY OF DISCUSSION

Larry Conrad
Columbia County Planning
Department

(Continued from Page 1)

(2) Birkenfeld-Mist C-PAC:

Chairman: Robert Van Natta (attorney), Route 1, Box 560, Rainier 97048. This committee held their election last week. Will be meeting again the second or third Thursday of February.

(3) Rainier-Fernhill C-PAC:

Chairman: Don Davis, Route 3, Box 1240-A, Rainier 97048. This committee is meeting on January 22. OK to address material to Mr. Davis, as he will still be on the committee whether he is chairman or not.

(4) Scappoose-Spitzenberg C-PAC:

Chairman: Fred Bartel, Route 1, Box 324, Scappoose 97056. This committee will meet Monday evening, January 28. Mr. Bartel's term expires this year and he might not be re-elected chairman.

(5) St. Helens-Columbia City C-PAC:

Chairman: Mr. Voris Probst, P. O. Box 275, St. Helens 97051. Their election has been held.

(6) Tide Creek C-PAC:

Chairman: Roger Nichols, Route 1, Box 564, Rainier 97048. This committee has held its election, and will not meet again until sometime in February. Chairman may have difficulty in getting touch with members.

(7) Upper Nehalem Valley C-PAC:

Chairman: Richard D. Fletcher, Mist Star Route, Box 16, Vernonia 97064. Mr. Fletcher may not be the new chairman following their election, but will still be a committee member, as his term does not expire until 1981.

CONFERENCE AND TELEPHONE CALL REPORT

Date Jan. 22, 1980

TO: Jack Kiley
~~Office of the Administrator~~

Page 3

cc: ☐
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FROM: R. J. Gilbert

Include all telephone calls and conferences of importance bearing upon policies, customer or public relations, but excluding those purely technical in nature.

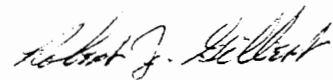
OUTSIDE CALLER OR CONFeree

SUMMARY OF DISCUSSION

Larry Conrad
Columbia County Planning
Department

(Continued from Page 2)

Sanja suggested that we write a cover letter to each of the seven C-PAC chairmen to accompany their copy of the green EIS FY-81 book, advising that BPA needs their comments by February 15, 1980, and asking that they get in touch with the members of their committee.



RJGilbert:ej



United States
Department of
Agriculture

Soil
Conservation
Service

Room 345
304 North 8th Street
Boise, Idaho 83702

January 22, 1980

Environmental Manager
Bonneville Power Administration
P. O. Box 3621 - SJ
Portland, Oregon 97208

Dear Sir:

My staff has reviewed your Fiscal Year 1981 Construction and Maintenance Program Draft Environmental Impact Statement and have the following comments:

Any maintenance program, particularly spraying of rights-of-way, should be correlated with private landowners using those lands for grazing purposes. Long range plans should be developed so grazing and spraying would not be in conflict.

We wish to thank you for the opportunity to review and comment on your construction and maintenance program environmental impact statement.

Sincerely,

Amos I. Garrison, Jr.
State Conservationist



COLUMBIA COUNTY SCHOOL DISTRICT NO. 13
Rainier, Oregon

R E S O L U T I O N

January 21, 1980

WHEREAS, Bonneville Power Administration conducted a public hearing at Rainier Elementary School on January 17, 1980, proposing that one of their alternatives would be to construct a new 500 KV power line crossing property owned by Columbia County School District No. 13 that is being used for school purposes; and

WHEREAS, the proposed line would cross 1751 feet of land being farmed by the District's vocational agriculture classes; and

WHEREAS, the School District cannot use property under the power lines for play areas; and

WHEREAS, the width of the present right-of-way would necessarily be widened in order to replace the existing power lines; and

WHEREAS, the power lines would cross and possibly destroy existing wetlands being developed by the School District, and

WHEREAS, the School District is not interested in selling more property or granting more easements; and

WHEREAS, the School District would be expending more money to control noxious weeds that grow on power line corridors; and

WHEREAS, it is difficult to make sound judgments on the basis of information given at the hearing;

THEREFORE, BE IT RESOLVED that the Board of Directors of Columbia County School District No. 13 protest the plan that Bonneville Power Administration proposes to cross District property with new lines and towers; and

BE IT FURTHER RESOLVED that the Board of Directors recommend that Bonneville Power Administration adopt their plan "C" and stay in

the State of Washington by way of the Alston, Longview and Lexington sub-stations.

RESOLUTION unanimously adopted by the Board of Directors at Special Session
this 21 day of January, 1980.

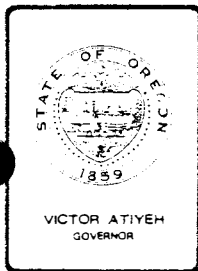


Clerk, Columbia County School Dist. #13
John L. Cermak

COPIES SENT TO:

- John Kiley, Environment Manager
Bonneville Power Administration
P. O. Box 3621 - SJ
Portland, OR 97208
- Honorable Charles Hanlon
Oregon State Senate
Senate Chamber
Salem, OR 97310
- Columbia County Commissioners
Columbia County Courthouse
St. Helens, OR 97051
- Public Utility Commission of Oregon
Labor & Industries Building
Salem, OR 97310
- Mayor Betty Vilhauer
P. O. Box A
Rainier, OR 97048
- Honorable Caroline Magruder
State Representative
Clatskanie, OR 97016

Columbia County School District No. 13
P.O. Box 318
Rainier, Oregon 97048



Department of Transportation
PARKS AND RECREATION DIVISION

525 TRADE STREET S.E., SALEM, OREGON 97310

January 22, 1980

Mr. John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621 - SJ
Portland, OR 97208

Dear Mr. Kiley:

RE: Bonneville Power Administration Draft EIS - 1981 Program
(September 1979)

In reviewing the above document we placed special attention on that portion of the EIS concerning the Allston - Portland Area Reinforcement Study Area 80-1. Although the EIS recognizes the existence of the Sandy River State Scenic Waterway, the report fails to inventory or recognize the Clackamas River State Scenic Waterway. The Clackamas River State Scenic Waterway extends from River Mill Dam at Estacada, approximately 15.4 miles downstream, to Carver. This river segment was added to the State Scenic Waterway system in 1975 by the Oregon State Legislature. The purpose of the State Scenic Waterway system is to protect and enhance the natural, esthetic, scenic, fish and wildlife, scientific, and recreational values of each individual designated river.

The Oregon State Scenic Waterways Act and the Oregon Transportation Commission's Scenic Waterway management rules and regulations require that no utility facilities be constructed or improved without written notification to the Oregon Transportation Commission. Once notification has been made the Commission will evaluate the visual impact of the proposal on the scenic waterway. The Commission's rules state:

"The Commission, whenever practicable, will require the sharing of land and airspace by such facilities and utilities. All permissible transportation facilities and utilities shall be so located as to minimize impairment of the natural beauty of the scenic waterway. For example, it will be desirable to place electrical and telephone lines underground wherever reasonably practicable." (emphasis added)

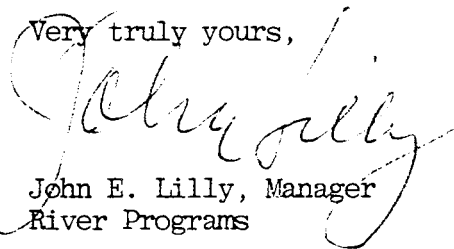
Mr. John Kiley
January 22, 1980
Page 2

The Clackamas River State Scenic Waterway is presently crossed by a major Bonneville Power Administration transmission line just upstream of Barton County Park. We would encourage your agency to give strong consideration to locating future B.P.A. crossings outside of the designated scenic waterway area. However, if this is not practical then we would recommend B.P.A. consider sharing of the existing right-of-way and the provision of vegetation screening between the transmission towers and the river.

If your agency has questions or concerns about the Oregon State Scenic Waterway system, please contact me at 378-6500.

Thank you for this opportunity to comment.

Very truly yours,

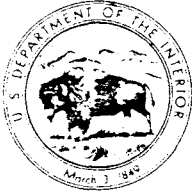


John E. Lilly, Manager
River Programs

JEL:ma

Enclosure

cc: State Clearinghouse



United States Department of the Interior

OFFICE OF THE SECRETARY

PACIFIC NORTHWEST REGION

500 N.E. Multnomah Street, Suite 1692, Portland, Oregon 97232

January 25, 1980

ER-79/1159

Mr. John Kiley
Environmental Manager
Bonneville Power Administration
P. O. Box 3621 - SJ
Portland, Oregon 97208

Dear Mr. Kiley:

The Department of the Interior has reviewed the draft environmental impact statement for the BPA Proposed Fiscal Year 1981 Program. The following comments are provided for your consideration when preparing the final document.

General Comments

The greatest adverse impact of transmission facilities to the general public usually is visual and the severity of impact is magnified where it occurs in otherwise undeveloped or agricultural areas. Accelerated land development in the Pacific Northwest increases the value of remaining undeveloped lands and farms to the public for visual and psychological relief. This value is present even for uncluttered rural areas that are not particularly scenic because of their diminishing supply, especially in urbanizing areas. Presence of scenic features, of course, places an additional premium on such lands.

We are pleased to see continued consideration by BPA of paralleling and upgrading existing transmission lines as a means of mitigating adverse visual impacts of new facilities. This type of development in most cases has far less adverse impact on recreation and scenic resources than new transmission routes. However, the DES is unclear as to the extent to which the visual value of undeveloped land, as opposed to economic and other considerations, is considered in deciding the necessity of new rights-of-way. We therefore suggest an additional alternative in the final statement, wherein maximum possible use is made of existing corridors. Discussion of the alternative should include an analysis of disadvantages, including increased costs, and should weigh these against the public benefits of not constructing new facilities in undeveloped and agricultural areas.

We are concerned that the difficulty in assigning a dollar value to the visual quality of a landscape may lead to undue emphasis being given to short-term economic advantages in deciding the necessity for new rights-of-way. We urge the decision process give full consideration to the long-term intangible social benefits of preserving visual landscape quality. In each case where the decision is made to establish a new transmission line route, the DES for the facility location plan should present a full evaluation of all factors considered, including comparative costs and a description of intangible benefits foregone.

As with programs proposed for previous fiscal years, we consider that implementation of the 1981 program will be generally beneficial to minerals-related industries. Meanwhile, we urge that BPA and any other planning authorities involved in the proposed program avail themselves of the information contained in the automated data files of the Bureau of Mines' Mineral Industry Location System (MILS). Potential land use conflicts with mines, quarries, or other minerals-related activities might thus be avoided during the early stages of selecting transmission line routes and substation locations.

Problems to be created by proposed line changes are identified quite clearly in the report; i.e., possible change of land use patterns, possible erosion problems, contamination of streams, an other water sources, and effects on wildlife. These effects are not necessarily desirable to the area; however, some of these problems already exist with present existing lines. The discussion of mitigation of problems created by proposed line changes is considered to be too brief in some instances. Two examples are roadways for construction and potential pollution of water sources.

The proposed program could be strengthened by including provisions for water-quality monitoring of surface- and ground-water sources draining vegetation management areas (page 20, item 2) and storage areas for electrical components containing polychlorinated biphenyls or PCB's (page 49-50, item 3).

The draft statement should consider, at least in a general manner, the potential for secondary impacts from increases in irrigation as a result of the availability of additional power.

As was noted throughout the subject document, proposed construction activities may require U. S. Coast Guard and Corps of Engineers, U. S. Army, permits for which we have review responsibilities. Accordingly, our comments do not preclude an additional and separate evaluation by the U. S. Fish and Wildlife Service pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.). In review of permit

applications, the Fish and Wildlife Service may concur, with or without stipulations, or object to the proposed work, depending on specific construction practices which may impact fish and wildlife resources.

Specific Comments

Page 22, b(1) Fish Resources. Although general impacts to fish resources are discussed, it should be mentioned that many of the potential impacts may occur to anadromous species of tremendous value to sport and commercial users. Furthermore, the bulk of the impact will occur in a system (Columbia River and tributaries) that already has suffered repeated adverse modifications from water development projects. Other highly valued resident species occur in the project area and may suffer impacts from the proposed actions. We believe this section should be expanded to address these issues.

Page 26. This discussion on impacts to wildlife is misleading and incomplete. The most severe loss of wildlife populations will occur from habitat loss and modification and not increased hunting pressure through increased access. The statement that minimal impacts will occur to wildlife in farmland and previously disturbed areas is an unfounded generalization. Major populations of many wildlife species occur in those areas and may be impacted by the proposed action. The document should address these issues in a more clear and concise discussion.

Page 27, last paragraph. Losses to small animal populations within the right-of-way may be more than temporary. If suitable habitat is not available, the species in question will not reestablish to former levels.

Page 28. Bird mortalities resulting from power line collisions have been well documented. We do not consider this loss potential as insignificant especially when large concentrations (such as migrating waterfowl) are prevalent near power lines. Admittedly, illegal shootings are a serious problem but the cumulative effect of collisions may be a more serious problem. We believe your discussion should be oriented in this fashion.

Page 36, last paragraph and page 37, first paragraph. The discussion on possible increased growth and development as a result of a new or expanded power source and subsequent increased environmental impacts is well noted. Specific areas where this may occur as a result of the proposed actions should be identified.

Pages 45-47, Historical, Archeological, and Natural Landmarks. The National Register Program has been transferred from the National Park Service to the Heritage Conservation and Recreation Service, and appropriate changes in the text should be made to reflect this.

Page 50, first paragraph. The extremely hazardous effects of PCB's to fish and wildlife are well documented, and the potential for accidental contamination exists. We believe it would be far safer for non-PCB transformers to be used in the proposed construction in lieu of the gradual phase-out as planned.

Page 51, Paralleling. The last full paragraph states that reliability criteria are the principal restrictions limiting the implementation of paralleling, due to the possibility of natural calamity and sabotage. Because of the value of paralleling as a mitigation measure, we feel this subject should be expanded in the final statement. Data should be included indicating the degree to which natural calamities and sabotage are an actual problem. Preventive measures and the degree to which the above factors influence decisionmaking should be discussed. Benefits to surveillance of single versus multiple corridors should be considered in the FES.

Page 53, C. Other. It would be most helpful to list the potential mitigation measure that might be used in this document in lieu of referring the reader to Appendix B of the BPA Role EIS, 1977.

Page 54, Unavoidable Adverse Environmental Impacts, fourth paragraph. Impacts to fish resources will also occur during maintenance. This sentence should read, "...that would be crossed during construction and maintenance."

Page A-52, Appendix A. The Elmo substation will be scheduled for herbicide weed control. Also, on page A-21, the Kalispell-Kerr and Hot Springs-Anaconda power line rights-of-way passing through Lake County will be scheduled for vegetation control. The planned treatment is hand cutting followed by herbicide application to control stump sprouting. The Confederated Salish and Kootenai Tribal Council has not approved the use of herbicides for vegetation control. They should be consulted prior to the use of herbicides in the management of power line rights-of-way across tribal land.

Removal of vegetation on the existing right-of-way and on any new or enlarged right-of-way is a big problem. Tall growing vegetation will be a challenge whether done by mechanical means or with spray from a helicopter. Control of aerial application of herbicides is very difficult especially considering the large number of creeks and water areas that must be protected from contamination. Mechanical application is very expensive though preferable to aerial spraying for environmental as well as legal considerations.

Allston-Portland Area SA-81-1

We realize that a separate supplemental environmental impact statement will be written for this proposed project; however, we believe that comments are required on the information presented in this draft.

Page 7, Hydrology. In Plan A, the line would cross the North Fork Lewis River and East Fork Lewis River. The Lewis River extends only 3 miles up from the mouth. This should be corrected throughout the statement. The Kalama River would also be crossed in Plan A.

Page 8, first line. Nehalem drainage streams are associated with Plan B, not Plan A.

Page 8, par. 3 and 4. Plan A would also cross flood plain and wetland areas in the Vancouver Lake and Rivergate areas. Plan B would cross flood plain and wetland areas at the mouth of the Sandy River.

Page 9, par. 2, sentence 1. The Cowlitz and Coweeman Rivers appear to be out of the area under study.

Page 9, sentence 3. Eulachon and sturgeon are also present in the study area.

Page 9, penultimate sentence. The Columbia River is also important habitat for whistling swans from fall through spring, and this species should be added to those listed.

Page 10, par. 1. There is no mention of the Ridgefield National Wildlife Refuge, which is located along the Columbia roughly between Vancouver Lake and the Lewis River. This waterfowl refuge also receives high use for birdwatching and educational purposes.

Page 10, last par. The first sentence should be changed to say that the bald eagle does migrate through and inhabit the area.

Page 11, Agriculture. Agriculture is also found in the Vancouver Lake lowlands (Ross-Rivergate line).

Page 15, Recreation. There is no mention of fishing which is a major recreational activity in the area. Species fished for include salmon, steelhead, cutthroat and rainbow trout, sturgeon, shad, smelt, and warmwater game fish.

Page 15, par. 1. Ridgefield National Wildlife Refuge should be added as a waterfowl hunting area.

Page 15, par. 2. Other parks in the area include Tryon Creek State Park and Kelly Point Park on the Willamette, and Clark County's Moulton Falls Park on the East Fork of the Lewis. There is also a small park at Kalama.

Page 16A, Figure 2. There appears to be an error on the Plan A figure. The Western Cascade Foothills and Eastern Slope of the Coast Range labels appear to be reversed.

Page 21, Wildlife, Plan A and B. The discussion is centered only on large game mammals. Disturbance and destruction of vegetation from construction and maintenance will have adverse impacts on other forms of wildlife, particularly to some resident small game and nongame birds and mammals.

Page 34, Potential Unavoidable Adverse Impacts, first paragraph. Based on the nature and magnitude of the proposed construction, we suspect that adversities suffered by wildlife populations will be more than temporary as opined in this paragraph.

Page 34A, Figure 6, Land Use Summary. Plan A appears to include five (not three) major river crossings--Columbia at Kalama, Kalama, North and East Forks Lewis River, and Columbia at Vancouver. Plan B also appears to include five crossings (not one); namely, the Tualatin, Clackamas, the Sandy (twice), and the Willamette.

Table 3, Potential Adverse Impacts on Important Resources and Uses Within the Planning Study Area. The high impact to wildlife within the Columbia River area near Trojan shown in this table is not indicated in the narrative account of impacts presented on pages 20, 21, and 34. A change in the text on the referenced pages should be made to reflect these high impacts. Does the wildlife heading include fish as well or have they been inadvertently omitted?

These comments have been prepared and presented in the spirit of constructive assistance in achieving an accurate and concise final document. We reserve comment, however, on the proposed new transmission lines and substation pending review of the forthcoming environmental documents for those specific segments of the program. Thank you for the opportunity to review this document.

Sincerely yours,



Charles S. Polityka
Regional Environmental Officer



Forestry Department

OFFICE OF STATE FORESTER

2600 STATE STREET, SALEM, OREGON 97310 PHONE 378-2560

January 25, 1980

Mr. John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621-SJ
Portland, Oregon 97208

Dear Mr. Kiley:

We appreciate the opportunity to review your Proposed Final Year 1981 Program Draft Environmental Impact Statement (DEIS). Our Forest Resource Study team would like to make the following comments.

First, the BPA's Fiscal Year 1981 Proposals require the permanent removal of 1,400 to 1,900 acres of forest land from timber production. Removal of this forest land from timber production is in direct conflict with the Board of Forestry's policy to conserve Oregon's commercial forest land base. In the Forestry Program for Oregon, the Board of Forestry has recognized that the key to assuring an adequate timber supply in the future, especially with the predicted 22% decline in timber harvest volumes by the year 2000 (Timber for Oregon's Tomorrow), is the conservation of the forest land base. Only with this conservation of the forest land base can we be assured of adequate timber supply to meet the future economic and social needs of the people of Oregon.

The Oregon State Department of Forestry strongly recommends that the BPA take a closer look at alternative proposals which will not remove forest land from timber production.

Second, Alternative B, for the Allston-Portland Area Reinforcement, calls for the construction of a 500 kV line from the Allston Substation to Keeler Substation. This line could parallel an existing line which passes through several miles of Oregon State Department of Forestry owned lands and would require the widening of the existing route.

The Department of Forestry finds alternative B to be very unsatisfactory. Construction of these lines will have two major impacts. First, the widening of the existing route will remove high site forest lands from timber production. Second, the presence of these lines will severely

constrain our ability to effectively manage the adjacent forest lands. Harvest, by a cable logging system, will be impossible on the area bordering the right-of-way route. Tractor logging would be possible in these areas, however, this system has potentially adverse environmental effects and therefore is not a feasible alternative.

The Oregon State Department of Forestry does not feel that it can afford to lose this much forest land and recommends that the BPA consider an alternative proposal which will not require the widening of the existing route through lands owned by the Department of Forestry.

Third, and last, the Department of Forestry feels that the long and short-term economic impacts of removing these 1,400 to 1,900 acres of forest land from timber production have not been adequately discussed. It is stated in the DEIS that "Timber from these forest lands plays an important and sometimes dominant role in the economics of the communities and counties of both states (Oregon and Washington), creating jobs, payrolls and taxes" (p. 13 of Draft Facility Planning Supplements: Allston/Portland Area Service). However, no attempts have been made in the DEIS to quantify the impact of removing these acres from production. How much will forestry related employment be decreased and what decrease in tax revenues can each county expect from the permanent removal of this timber? Since the BPA is considering the permanent removal of forest land, what are the long term economic impacts of not having a sustained timber flow from these lands?

The Oregon State Department of Forestry requests an adequate discussion of the long and short-term economic impacts of the removal of these 1,400 to 1,900 acres of forest land on local employment and county revenues, and a discussion of alternative routes which would have fewer impacts upon the forest land.

Sincerely,

H. MIKE MILLER
State Forester


BY: Sue Joerger
Forest Resource Staff Assistant

SJ:lp
4209B
cc: State Clearinghouse (79124-140)
Carl Smith
Pat Amedeo
Bill Phelps



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

January 23, 1980

Environmental Manager
Bonneville Power Administration (BPA)
P.O. Box 3621 SJ
Portland, Oregon 97208

Dear Sir:

We have reviewed the Draft Environmental Impact Statement (EIS) for the Fiscal Year 1981 Construction and Maintenance Program in the Pacific Northwest and the draft facility planning supplement on BPA's proposed Allston-Portland area reinforcement. We are responding on behalf of the Public Health Service and are offering the following comments.

We understand the proposal includes the construction of about 265-288 miles of transmission line and two new substations and the maintenance of 18,646 acres of rights-of-way and roads.

In general, we have no major concerns regarding the proposal. We do, however, have some concern about the lack of discussion in the EIS (p. 49) regarding the possible health effects from electrostatic and electromagnetic fields. No summary of the research that has been done on the potential short-term and long-term effects from electric and magnetic fields of the type found under and around the proposed transmission lines could be found in the EIS.

We believe that open burning of slash should be discouraged. Alternative methods of disposal should be pursued. The use of special harvest equipment may help prevent the need for excessive movement of chippers and road development. The chipped debris and other mulching material can, if properly scattered, provide a protective cover until vegetation stabilizes the soil from erosion. Slash disposal by windrowing in the rights-of-way should also be considered.

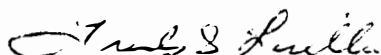
Alternatives to herbicide control should be considered in controlling vegetative growth in transmission rights-of-way. Conversion of previously timbered areas or other non-use areas to public or private grazing lands with incentives to promote its use would eliminate the need for herbicide control and provide some public benefits. We believe that the use of herbicides in controlling vegetation by broadcasting or aerial spraying should be restricted only to those areas that are not accessible by surface vehicles and where hand or mechanical clearing is not possible. Additional information should also be provided on the potential human health effects from the herbicides which will be used most frequently.

Page 2 - Environmental Manager

We recognize that polychlorinated biphenyls (PCBs) are utilized in some of BPA's transformers, capacitors, and storage containers. According to the EIS, all PCB components as they fail will be replaced with non-PCB components. It is also important that any new installations not use any PCB components.

We appreciate the opportunity to review this EIS. Please send a copy of the final document when it becomes available.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Frank S. Lisella".

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Bureau of State Services



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

February 22, 1980

Mr. John E. Kiley
Environmental Manager
Department of Energy
Bonneville Power Administration (BPA)
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Kiley:

Thank you for sending us your publication on Electrical and Biological Effects of Transmission Lines: A Review and Appendix B BPA Power Transmission. In discussing biological effects of electric fields in the EIS, consideration should be given to minimizing any potential occupational hazards from the transmission lines in farm fields or orchards where large farm equipment and transport vehicles might be used. It would also be helpful to describe in the EIS the existence and nature of specific use restrictions within the transmission corridor and any special ground clearances of transmission lines (where ground activity is considerable and potentially incompatible) to minimize public health hazards.

We appreciate the information that you sent us and we are looking forward to receiving the final EIS.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Bureau of State Services



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
ARCADE PLAZA BUILDING, 1321 SECOND AVENUE
SEATTLE, WASHINGTON 98101
January 25, 1980

REGION X

Office of Community Planning
and Development

IN REPLY REFER TO:

10C

Mr. Ray Foleen
Acting Administrator
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Foleen:

Re: Draft Environmental Impact Statement
Bonneville Power Administration
Proposed Fiscal Year 1981 Program

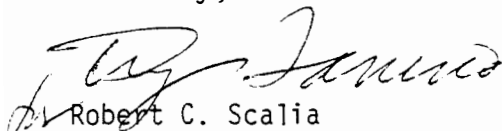
OFFICIAL FILE COPY	
No.	Date
	JAN 28 1980
Referred To	
Action Taken	
<input type="checkbox"/> ANS.	<input type="checkbox"/> NO REPLY
By	Date

In your December 4, 1979 letter you asked us to identify any additional environmental factors or impacts which should be included in your evaluation.

Our concerns are covered on page 38 under Urban and Residential. As you note in this section, land use conflict will be examined in more detail when site specific environmental impact statements are prepared. In these site specific evaluations we would like to see compliance with local land use plans given strong consideration. We also understand that transmission lines and substations could be a source of noise. Again in the site specific evaluations we would suggest including expected noise levels for those facilities located in or passing through residential zone areas.

Thank you for the opportunity to comment.

Sincerely,


Robert C. Scalia
Director
Regional Office of CPD

Rt. 3, Box 3305
Rainier, Oregon 97048
January 24, 1980

Mr. John Kiley, Environmental Manager
BPA
P. O. Box 3621-SJ
Portland, Oregon, 97208

Dear Sir:

SUBJECT: Draft Environmental Impact Statement
Proposed Fiscal Year, 1981,
Appendix B: Allston-Portland
Area Reinforcement.

My statements are devoted to Plan B, Page 8, Subject Vegetation. You refer to this area as being in the Western Hemlock vegetative zone. This might be true close to the coast. But in the area near the Allston-Keeler line, I would expect to find Douglas Fir making 95% of the conifer mix.

REFER: Page 12, Forestry

My experience as a tree farmer tells me that your chart on tree growth has grossly understated the timber growth potential of this area. Your chart tells me you expect to grow 85 cubic ft./ac/year with a 60-year rotation.

Experience tells me I can expect to harvest 1.5 x 85 cu. ft./ac/year with a 40-year rotation. The present Allston-Keeler line removes about 40 acres per mile from timber production. A parallel line would remove about another 20 ac/mile for a total of 60 acres per mile. Given the 53 miles of timber land that Plan B crosses, it seems incredible to me that anybody would consider destroying another 1000 acres of the Douglas Fir ground in Western Oregon.

The Sunday Oregonian, 20 January, 1980, had an article about a sawmill, (St. Johns Forest Products), in Portland, Oregon. That mill could have been operated for more than a month a year on the annual timber growth destroyed by the present line and by the proposed new construction.

My calculation tells me that twenty (20) forestry jobs and forty (40) service jobs will be lost by removal of this land from timber production (both present and proposed line)

REFER: Page 19, Paragraph 2, Vegetation. "Tansy ragwort could cause a severe weed problem as a result of clearing; however BPA would work with local county weed control programs and landowners to control tansy ragwort".

Mr. John Kiley
Page 2
January 24, 1980

STATEMENT: Tansy ragwort has not been properly controlled under the present Allston-Keeler line and continues to spread to nearby private land. On Page 21, second paragraph, it should be noted the deer and elk may be adversely affected by eating tansy ragwort.

REFER: to Paragraph 7, Page 24, Forestry, "A minor decrease in timber industry jobs, depending on acres and volumes affected, may occur".

I presume this could be called minor by a bureaucrat in a warm office with a guaranteed income and 100% job security. I can assure you that this job loss will not be considered minor by the sixty people included.

Your statements about potential forestry values are so bad that I can only assume that you are intentionally understating the values in preparation to condemning the ground for a power line.

Sincerely yours,



Kay C. VanNatta

ROBERT K. ERICKSON
ERIXHILL
RT.3 BOX 28-A
SCAPPOOSE, OR. 97056
January 28, 1980

John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621-SJ
Portland, Oregon 97208

Dear Sir:

Re: Keller-Allston Transmission Line

A few years ago, when this power line was constructed, eighteen acres of our family tree farm were ravaged for power and progress. At that time BPA spokesman said that at a future date more lines might be added on to the towers that were then to be built; nothing was said of widening the right of way and constructing more towers. The existing line passes thru timber land in Columbia County that has some of the best Douglas fir growing soil and climatic conditions in the world.

We conduct our tree farming in a manner so as to promote conservation, recreation, and productivity while still retaining esthetic and environmental qualities that are compatible with nature. Any Additional BPA right of way is a direct assault upon every principle on which we stand. My family and myself are prepared to protest further acquisition of prime timber land in Columbia county. I know that we are not alone in this protest.

We will support your use of your technology to hang more lines on the existing towers but do not take more land!

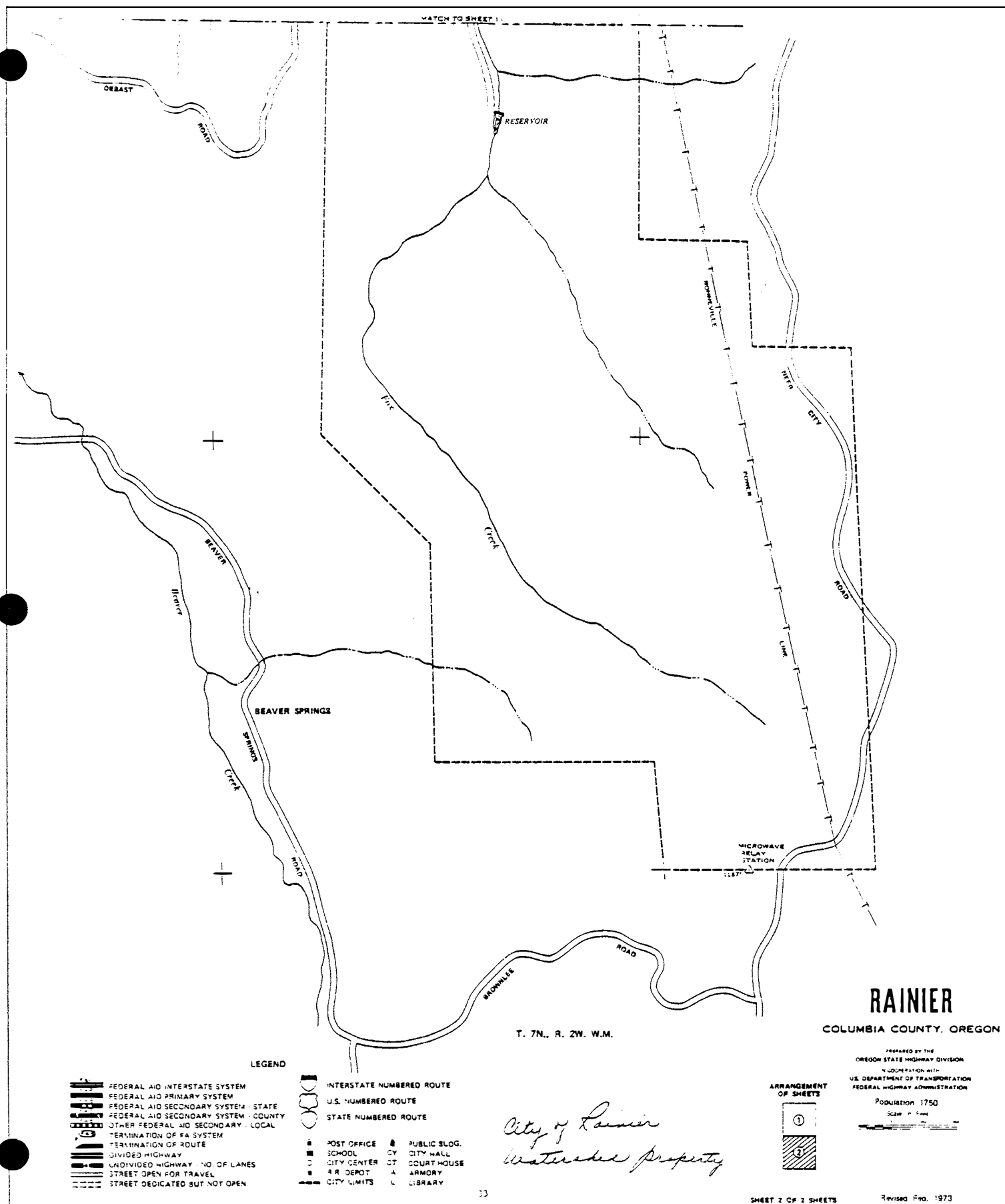
We resent the fact that we were not notified of BPA's intentions and that the final input date of January 31, had almost past when we were advised by neighbors of the impending acquisition.

Sincerely,



Robert K. Erickson

City of Rainier
P.O. Box A
Rainier, Oregon 97048



COWLITZ COUNTY P U D • ELECTRIC AND WATER SERVICE

960 COMMERCE AVENUE • LONGVIEW, WASHINGTON 98632 • TELEPHONE 206 423 - 2210

Board of Commissioners:

JOE B. HILL JOHN M. SEARING HOWARD B. RICHMAN

General Manager:

ROBERT L. McKINNEY

January 24, 1980

Bonneville Power Administration
P. O. Box 3621-SJ
Portland, OR 97208

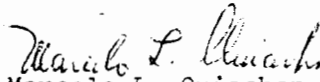
Attention: Mr. John Kiley
Environmental Engineer

Gentlemen:

Enclosed please find our comments on the Draft Environmental Impact Statement for the Allston-Portland Area Reinforcement.

Thank you for giving us the opportunity to comment on this project.

Very truly yours,


Marcelo L. Quiachon, P.E.
Chief Engineer

bjm

Enclosures

COWLITZ COUNTY P U D . ELECTRIC AND WATER SERVICE
960 COMMERCE AVENUE • LONGVIEW, WASHINGTON 98632 • TELEPHONE 206 423-2210

Board of Commissioners:

JOE B. HILL JOHN M. SEARING HOWARD B. RICHMAN

General Manager:

ROBERT L. MCKINNEY

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
STUDY AREA 81-1, THE ALLSTON-PORTLAND AREA REINFORCEMENT

Submitted to

BONNEVILLE POWER ADMINISTRATION

By

COWLITZ COUNTY PUBLIC UTILITY DISTRICT

January 28, 1980

Cowlitz County Public Utility District wishes to comment on the Bonneville Power Administration's Draft Environmental Impact Statement Study Area No. 81-1, the Allston-Portland Area Reinforcement.

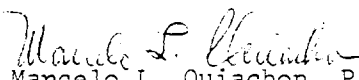
The Cowlitz County Public Utility District is a public electric utility serving the electrical needs of residential, commercial and industrial consumers of the County of Cowlitz, State of Washington. The utility district is being supplied by Bonneville Power Administration with its bulk power requirements through the BPA transmission grid. The Allston-Portland Reinforcement Project would affect the Cowlitz County PUD as one of BPA's customers.

We concur with BPA that the proposed reinforcement project is necessary to maintain the reliability and capability of the BPA transmission system in serving its customers present and projected loads. We agree that Plan A is the most logical route for the transmission line addition as it is the shortest route and will, therefore, have less impact on the environment.

Cowlitz County PUD requests that BPA consider, if feasible, providing a 115 kV transmission circuit which would be constructed with its proposed 500 kV circuits and would provide a future tie to the transmission system of Clark and Cowlitz County Public Utility Districts. If this request is feasible, Clark and Cowlitz PUD's would share the cost of this line thereby eliminating duplicate costs and minimizing transmission line right-of-way required.

Cowlitz County PUD, therefore, endorses the implementation of BPA's proposed Allston-Portland Reinforcement Project.

Very truly yours,


Marcelo L. Quiachon, P.E.
Chief Engineer

bjm



STATE OF
WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Mail Stop PV 11
Olympia, Washington 98504
206 753 3800

January 25, 1980

Monica Jenkins
Office of Financial Management
House Office Building, AL-01
Olympia, Washington 98504

Dear Ms. Jenkins:

Thank you for the opportunity to comment on the draft environmental impact statement for the fiscal year 1981 program proposed by the Bonneville Power Administration. Headquarters and regional personnel have reviewed the EIS and have the following concerns.

The draft EIS contains limited information on road construction and maintenance. The final EIS should contain specific information on the methods of road construction, road maintenance, and erosion control to determine whether minimum water quality protection goals will be met. This should include a description of methods to prevent damage to fish resources and domestic water supplies caused by fording small streams. Also, there should be a description of the type of road drainage facilities which will be used to prevent erosion.

The EIS indicates the unauthorized use of roads is common and may result in additional erosion and stream siltation. Those roads that are not designed for all weather use should be blocked or gated to minimize the occurrence of unauthorized use.

The discussion of vegetation management with herbicides indicates there will not be spraying within 100 feet of streams, lakes, etc. Aerial spraying from above transmission facilities probably requires that aircraft fly at an elevation of 150 to 200 feet above ground. At that height, the likelihood of chemical drift is greatly increased, thus resulting in chemical application to non-target areas. Additional information on drift measures and alternatives to vegetation management with herbicides should be included in the final EIS.

The projects described in this program may require a shoreline substantial development permit if they meet the criteria in the enclosed regulations. If a permit is needed, the project must meet the requirements of the local governments' shoreline master program.

Monica Jenkins
January 25, 1980
Page 2

If you have any questions, please contact Norm Nass of our Southwest Regional Office (753-2892), or Leighton Pratt of our Shorelands Division (753-6865).

Sincerely,

Barbara J. Ritchie

Barbara J. Ritchie
Environmental Review Section

BJR:mgh

cc: Norm Nass, DOE, Southwest Region
Leighton Pratt, Shorelands
Bonneville Power Administration

PIERCE

COUNTY

COUNTY-CITY BUILDING

TACOMA, WASHINGTON



PIERCE COUNTY PLANNING DEPARTMENT
J.N. SHENSKY, Director

January 28, 1980

Environmental Manager
Bonneville Power Administration
P.O. Box 3621 - SJ
Portland, OR 97208

Dear Sir:

Pierce County has reviewed the Draft Environmental Impact Statement for Bonneville's Proposed Fiscal Year 1981 Program. We do not wish to comment at this time.

Sincerely,

A handwritten signature in cursive script that reads "Dan Cagle".

DAN CAGLE
Environmental Official

DC:scw

SKAMANIA REGIONAL PLANNING COUNCIL

20 CASCADE AVENUE - P. O. Box 152
STEVENSON, WASHINGTON 98648
Phone (509) 427-5418

January 24, 1980

John Kiley, Environmental Manager
Bonneville Power Administration
P. O. Box 3621 - SJ
Portland, Oregon 97208

SUBJECT: Fiscal Year 1981 Construction and
Maintenance Program Draft Environmental
Impact Statement

Dear Mr. Kiley:

The Skamania Regional Planning Council has reviewed your Fiscal Year 1981 Construction and Maintenance Program Draft EIS. The Council is concerned about the use of ariel spraying in Skamania County, particularly in the Columbia River Gorge where strong wind conditions often exist. The current plan proposes the use of water and oil based herbicides that are applied by ariel or ground methods in Skamania County. It is hoped that every effort is made to use pelletized forms of herbicides rather than ariel sprays to minimize any environmental impact.

Thank you for your consideration of our comments.

Sincerely,



Harold P. Lange, Chairman
SKAMANIA REGIONAL PLANNING COUNCIL



OREGON ENVIRONMENTAL COUNCIL

2637 S.W. WATER AVENUE, PORTLAND, OREGON 97201 / PHONE: 503/222-1963

January 30, 1980

Comments Submitted to

Bonneville Power Administration

on the

Draft EIS for the Proposed FY 1981 Program

The Oregon Environmental Council would like to comment on the portion of the proposed FY 1981 Program which lies in western Washington and Oregon. The Draft EIS shows two plans as alternatives for transmitting additional electrical energy from the north (Allston Substation, near Rainier) to and through the Portland area.

Both plans involve many miles of new transmission-line corridor through regions of exceptional scenic beauty. Both forest and farmland would be affected. Unless a high level of necessity can be demonstrated, these plans should be rejected. We would like to expand on this:

Predicted Need

During the 1960's and the early 1970's, the commonly-accepted prediction for electrical load growth was that it would "double every decade". The Draft EIS (pg. 2) shows an increase of 3.7 percent per year. This is a doubling every two decades. It is possible that lower estimates may occur in the future.

The alternative of conservation is not taken seriously in the Draft EIS (pg. 6). In the proposed Allocation Plan recently discussed at BPA preference customers would be eligible to receive more power from BPA if serious conservation efforts were undertaken. The effect of this possible overall reduction should be noted in the EIS for the FY 1981 Program.

A part of the justification for new transmission lines in Western Washington and Oregon is the anticipation of continued large power flows from Canada to California. (SA 80-1, pg. 2) The EIS should reference load-growth predictions in Canada, to demonstrate the degree of credibility of this prediction.

ALTERNATIVE FUTURES, Tigard
AMERICAN INSTITUTE OF ARCHITECTS
Portland Chapter
AMERICAN SOCIETY OF LANDSCAPE
ARCHITECTS
Oregon Chapter
ASSOCIATION OF NORTHWEST STEELHEADERS
ASSOCIATION OF OREGON RECYCLERS
AUOUBON SOCIETY
Central Oregon, Corvallis, Portland, Salem
BAY AREA ENVIRONMENTAL COUNCIL
Coos Bay
B.R.I.N.G.
CENTRAL CASCADES CONSERVATION COUNCIL
CHEMEKETANS, Salem
CITIZENS FOR A BETTER GOVERNMENT
CITIZENS FOR A CLEAN ENVIRONMENT
CLATSOP ENVIRONMENTAL COUNCIL
CONCERNED CITIZENS FOR AIR PURITY
Eugene
DEFENDERS OF WILDLIFE
ECO-ALLIANCE, Corvallis
ENVIRONMENTAL ACTION CLUB
Parkrose High School
EUGENE FUTURE POWER COMMITTEE
EUGENE NATURAL HISTORY SOCIETY
GARDEN CLUBS of Cedar Mill, Corvallis,
McMinnville, Nehalem Bay, Scappoose
GRANT COUNTY CONSERVATIONISTS
H.E.A.L., Azalea
LAND, AIR, WATER, Eugene
LEAGUE OF WOMEN VOTERS
Central Lane, Coos County
MCKENZIE GUARDIANS, Blue River
NORTHWEST ENVIRONMENTAL DEFENSE
CENTER
OBSIDIANS, Eugene
1,000 FRIENDS OF OREGON
OREGON ASSOCIATION OF RAILWAY
PASSENGERS
OREGON BASS AND PANFISH CLUB
OREGONIANS COOPERATING TO PROTECT
WHALES
OREGON FEDERATION OF GARDEN CLUBS
OREGON GUIDES AND PACKERS
OREGON HIGH DESERT STUDY GROUP
OREGON LUNG ASSOCIATION
Portland, Salem
OREGON NORDIC CLUB
OREGON NURSES ASSOCIATION
OREGON PARK & RECREATION SOCIETY
Eugene
OREGON ROADSIDE COUNCIL
OREGON SHORES CONSERVATION COALITION
O.S.P.I.R.G.
PLANNED PARENTHOOD ASSOCIATION, INC.
Portland
PORTLAND ADVOCATES OF WILDERNESS
PORTLAND RECYCLING TEAM, INC.
RECREATIONAL EQUIPMENT, INC.
SANTIAM ALPINE CLUB
Salem
SIERRA CLUB
Oregon Chapter
Columbia Group, Portland
Klamath Group, Klamath Falls
Many Rivers Group, Eugene
Mary's Peak Group, Corvallis
Mt. Jefferson Group, Salem
Rogue Valley Group, Ashland
SOLV
SPENCER BUTTE IMPROVEMENT ASSOCIATION
STEAMBOATERS
SURVIVAL CENTER
University of Oregon
THE TOWN FORUM, INC.
Cottage Grove
TRAILS CLUB OF OREGON
UMPOUA WILDERNESS DEFENDERS
WESTERN RIVER GUIDES ASSOCIATION, INC.
WILLAMETTE RIVER GREENWAY ASSOCIATION

Non-Construction

The Draft EIS states (pg. 5) that problems resulting from non-construction of the FY 1981 Program would probably cause the non-Federal utilities to construct their own transmission lines and facilities. That statement relates to the final item of this commentary, A Suggested Third Alternative for Construction.

Overloading the system during periods of peak demands, with the consequent likelihood of uncontrolled power failures, is not a viable alternative. A possibility of alleviating this overload is through planned rotation of outages to specified loads or geographical areas. This suggestion, however, would be one of last resort.

Forced curtailment of non-essential or wasteful uses of electrical energy would be another way to approach easing the loads if necessary.

The discussion on page 5 suggests that if the FY 1981 Program is not constructed, resulting unreliability might cause businesses or industry to move to other areas. However, other areas are also likely to experience energy shortfalls. Canada is no exception.

Another possibility for addressing the problem of overloads is "load management." BPA might consider the controlled restriction of certain loads at peak periods.

Load management technology is discussed (pg. 8) as if it were yet to be developed. It is being used now, in some countries such as Germany. Implementation in the Northwest would require time for permissive regulations, engineering, and installation.

The lack of any load-management plan is cited as a reason for not considering it in the FY 1981 Program. Is there any "plan for a plan?" If not, this question may continue to be raised without the problem being addressed. BPA must begin to address the lack of a load-management plan.

Plans A and B -- Effects upon the Biosphere

We believe these sections are contradictory and confusing. For example it appears that "Grazing animals will be protected" as stated on page 13, and people and animals are mentioned again on page 21, but it is unclear if protection will be given to wildlife in the forest or grazing in the lowlands. Domestic animals should not be the only type considered. The discussion on page 19 should reference mitigating comments included later in the Draft EIS such as on pages 49-50.

Although the Draft EIS states the use of poisons always bear the risk of accidental over-use or spillage, with resulting damage to animal life including fish. On page 41, however, the use of these poisons is described as "unavoidable." But then on page 14, clearing by machine and by hand is described as uneconomic, not impossible. Use of these poisons might in fact be avoided if other ways to remove brush were found to be feasible. A recent study by Jan M. Newton, Ph.D. shows that manual brushing may in fact be economically feasible. This section should perhaps be updated to include the most recent opinion and facts available.

The discussions on pages 49 and 50 explain that the herbicides used by BPA have low toxicity to animals. It is noted that such herbicides are "readily excreted". Information should be provided here to document the lack of effects on animals.

Plans A and B --Prime and Unique Farmlands

"BPA will not convert prime or unique farmlands to other uses unless other national interests override the importance of preservation...." (pg. 41). We would ask here what is the national interest(s); how is it determined and by who? Are essential uses of electricity delineated, as opposed to trivial or wasteful uses, in such a determination? The EIS should give some answers to these questions.

Plan A

Plan A includes a new 500-kv transmission line crossing of the Columbia River, just north of Trojan. The tower footing should not encroach upon wetlands near the river if this plan is adopted. We are also concerned about transmission lines crossing a major waterway and a major freeway.

Plan B


Plan B avoids the river crossing discussed under Plan B but does involve construction of a long stretch of transmission line corridor along the eastern slope of the Coast Range. The map in figure 4 shows the new Keeler-Rivergate double-circuit 230-kv line as crossing Forest Park. We oppose further degradation of Forest Park.

A Suggested Third Alternative for Construction

There is no discussion of what we see as a third alternative: restructuring or paralleling the existing PGE 230-kv line between Trojan and Rivergate, and adding a tie between Allston and Trojan. This would seem to avoid many of the environmental impacts we have discussed above.

OEC recommends study of this or other alternatives before a final Program is adopted.

Cordially


Judy Roumpf
Acting Director

cc: Arden Benson
OEC researcher



DEPARTMENT OF COMMUNITY DEVELOPMENT

PHYSICAL PLANNING • CODE ENFORCEMENT

207 FOURTH AVENUE NORTH • KELSO, WASHINGTON 98626 • TELEPHONE (206) 577-3052

January 29, 1980

Environmental Manager
Bonneville Power Administration
P.O. Box 3621 - SJ
Portland, OR 97208

RE: Draft E.I.S.: BPA Proposed Fiscal Year 1981 Program

Dear Environmental Manager:

The Allston-Portland Area Reinforcement Study described in the above referenced document proposes three river crossings in Cowlitz County in Plan A. The Columbia, Kalama and Lewis Rivers fall within the jurisdiction of the Shoreline Management Act of 1971, thereby necessitating substantial development permits from Cowlitz County for these crossings.

Depending on the exact location selected, the Columbia River crossing will be through either a Conservancy or Urban District in the Cowlitz County Shoreline Management Master Program. The portion of the Kalama River involved is designated Conservancy, and the Lewis River crossing will pass through either a Rural or Conservancy District.

The Goals and Policies section of the Master Program states that whenever utility facilities must be placed in a shoreline area, the location should be chosen so as not to obstruct or destroy scenic views. Whenever feasible, these facilities should be placed underground, or designed to do minimal damage to the aesthetic qualities of the shoreline area.

The following four standards will be used as criteria when evaluating a Shoreline permit application:

- a) All such utility systems shall be underground unless such undergrounding would not be feasible.

Feasibility of undergrounding electrical facilities will be evaluated among other things by applying established policies and practices of Cowlitz PUD.

- b) Where such utility systems occupy shoreline areas, clearing necessary for installation and maintenance shall be kept

to the minimum width necessary to prevent interference by trees and other vegetation with the proposed transmission facilities.

- c) Upon completion of installation of such utility systems or of any maintenance project which disrupts the environment, the disturbed area shall be regraded to compatibility with the natural terrain and replanted to prevent erosion and provide an attractive, harmonious vegetation cover.
- d) Utility hookup linkages to shoreline use facilities shall be underground where feasible.

As you point out, Plan A would cross the Columbia River floodplain north of Kalama. Any activity taking place within the 100-year floodplain will require a Floodplain Management Permit. Structures must be firmly anchored or affixed to the realty in order to prevent dislocation by floodwater and damage to life, health and property.

In addition, structures or works must not adversely influence the regimen of any body of water by restricting, altering, hindering or increasing the flow of the floodwaters.

Plan A did not specify whether the three river crossings in Cowlitz County would be areial or submerged. If an underwater crossing is being considered, what affects will high power cables have on local aquatic life and migratory fish paths?

You mentioned under the electrostatic and electromagnetic fields section that BPA has summarized much of the currently available findings regarding the effects of both short-term and long-term exposure to electric and magnetic fields of the type experienced under and around transmission lines in an appendix and a recent publication. Not having this information during this review process leaves us with many questions regarding the impact of Plan A on human health in the urban and residential section as well as the recreation section. How will a potential park site on Cottonwood Island be affected if the northern crossing of the Columbia River is chosen? Does exposure to these types of electric and magnetic fields create stress, generate resistance breakdowns, contribute to hypertension, heart attacks, headaches, drowsiness, nervous exhaustion, blood disorders and cancer in humans?

Likewise, what is the impact on plants and animals in the agricultural section? Even though BPA is not aware of any conclusive evidence or research findings indicating that exposure to electrostatic and electromagnetic fields near operating transmission lines results in any harmful effects to humans, animals and plants, what hypothosis or possibilities are known?

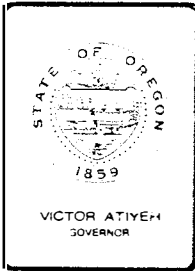
Plan A would affect approximately 12½ miles of timber land in Cowlitz County. For this reason, we strongly support the concept of paralleling existing lines. As you point out, the Comprehensive Plan emphasizes the importance of forest resources to the County's economy. More than 5,000 acres of forest lands are already occupied by utility corridors. What economic impacts have been calculated to result from the loss of forest lands in Plan A and Plan B?

We feel these questions should be answered so that a decision can be made in light of all the environmental impacts anticipated to result from the proposals. Thank you for the opportunity to review and comment on this document.

Sincerely,


Martin Carty, Director

MC:SD:as



Executive Department

155 COTTAGE STREET N.E., SALEM, OREGON 97310

January 30, 1980

OFFICIAL FILE COPY	
No.	Date JAN 31 1980
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Action Taken:	
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By	Date

Ray Foleen
Acting Administrator
Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, OR. 97208

1981 PROGRAM - BPA --- 7912 4 140

Thank you for submitting your draft Environmental Impact Statement for State of Oregon review and comment.

Your draft was referred to the appropriate state agencies. The Departments of Fish and Wildlife, Parks, Lands and Forestry offered the enclosed comments which should be addressed in preparation of your final Environmental Impact Statement.

We will expect to receive copies of the final statements as required by Council of Environmental Quality Guidelines.

INTERGOVERNMENTAL RELATIONS DIVISION

KAY WILCOX, A-95 COORDINATOR

KW:cb
Enclosures



OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

STATE CLEARINGHOUSE

Intergovernmental Relations Division
306 State Library Building, Salem, Oregon, 97310
Phone Number: 378-3732

PNRS STATE REVIEW

Project #: 7912 & 500

Return Date: 1-18-80

ENVIRONMENTAL IMPACT REVIEW PROCEDURES

If you cannot respond by the above return date, please call to arrange an extension at least one week prior to the review date.

ENVIRONMENTAL IMPACT REVIEW DRAFT STATEMENT

- () This project has no significant environmental impact.
- () The environmental impact is adequately described.
- (X) We suggest that the following points be considered in the preparation of a Final Environmental Impact Statement.
- () No comment.

Remarks

PLEASE SEE ATTACHED.

Selection of Plan B in the Allston-Portland Area Reinforcement System Project could potentially have significant positive impact on big game populations in Columbia and Washington counties. A transmission line corridor could provide a critical forage supply by creating several miles of forest opening.

The Bonneville Power Administration should consider developing a plan coordinated with the Oregon Department of Fish and Wildlife that would include the opportunity to improve wildlife forage. This improvement could result from the eradication of brush and trees by manual, mechanical or burning methods. Brush and tree removal could be followed by seeding a legume-grass mixture that would provide a sustained source of excellent big game forage. These seedings could be concentrated in areas of critical need.

The long range objective of a forage enhancement project would be to provide a strip of excellent big game forage on a sustained basis. If such a program were successful it may be practical to eventually phase out chemical brush control.

The Department does request the opportunity to review the Draft Facility Location Phase EIS for the Allston-Portland Area Reinforcement System.

The Oregon Department of Fish and Wildlife appreciates the opportunity to review and comment on this proposed program.



OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

STATE CLEARINGHOUSE

Intergovernmental Relations Division
306 State Library Building, Salem, Oregon 97310
Phone Number: 378-3732

P N R S S T A T E R E V I E W

Project #: 7912 4 140

Return Date: DEC 28 1979

DEC 28 1979
JAN 02 1980
1-18280
DEC 28 1979

ENVIRONMENTAL IMPACT REVIEW PROCEDURES

If you cannot respond by the above return date, please call to arrange an extension at least one week prior to the review date.

ENVIRONMENTAL IMPACT REVIEW DRAFT STATEMENT

- () This project has no significant environmental impact.
- () The environmental impact is adequately described.
- (✓) We suggest that the following points be considered in the preparation of a Final Environmental Impact Statement.
- () No comment.

Remarks

It will be necessary for new lines to avoid existing Oregon State Park lands and that site specific locations at existing state scenic waterways (John Day, Deschutes, Clackamas and Sandy Rivers) and historic sites be coordinated with this department.

PROJECT MANAGEMENT BRANCH

ASHE ☐ STE ☐
PLE ☐ RE ☐ PRE ☒

DEC 28 1979

REFERRED TO _____
FOR _____

FILE: PM FA LG.

Agency _____

By _____

P. D. McCosh



Department of Transportation
PARKS AND RECREATION DIVISION

525 TRADE STREET S.E., SALEM, OREGON 97310

MANAGEMENT RELATIONS DIVISION
JAN 25 1980

7912 4 140

January 22, 1980

Mr. John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621 - SJ
Portland, OR 97208

Dear Mr. Kiley:

RE: Bonneville Power Administration Draft EIS - 1981 Program
(September 1979)

In reviewing the above document we placed special attention on that portion of the EIS concerning the Allston - Portland Area Reinforcement Study Area 80-1. Although the EIS recognizes the existence of the Sandy River State Scenic Waterway, the report fails to inventory or recognize the Clackamas River State Scenic Waterway. The Clackamas River State Scenic Waterway extends from River Mill Dam at Estacada, approximately 15.4 miles downstream, to Carver. This river segment was added to the State Scenic Waterway system in 1975 by the Oregon State Legislature. The purpose of the State Scenic Waterway system is to protect and enhance the natural, esthetic, scenic, fish and wildlife, scientific, and recreational values of each individual designated river.

The Oregon State Scenic Waterways Act and the Oregon Transportation Commission's Scenic Waterway management rules and regulations require that no utility facilities be constructed or improved without written notification to the Oregon Transportation Commission. Once notification has been made the Commission will evaluate the visual impact of the proposal on the scenic waterway. The Commission's rules state:

"The Commission, whenever practicable, will require the sharing of land and airspace by such facilities and utilities. All permissible transportation facilities and utilities shall be so located as to minimize impairment of the natural beauty of the scenic waterway. For example, it will be desirable to place electrical and telephone lines underground wherever reasonably practicable." (emphasis added)

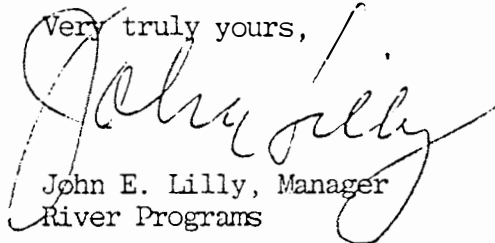
Mr. John Kiley
January 22, 1980
Page 2

The Clackamas River State Scenic Waterway is presently crossed by a major Bonneville Power Administration transmission line just upstream of Barton County Park. We would encourage your agency to give strong consideration to locating future B.P.A. crossings outside of the designated scenic waterway area. However, if this is not practical then we would recommend B.P.A. consider sharing of the existing right-of-way and the provision of vegetation screening between the transmission towers and the river.

If your agency has questions or concerns about the Oregon State Scenic Waterway system, please contact me at 378-6500.

Thank you for this opportunity to comment.

Very truly yours, /



John E. Lilly, Manager
River Programs

JEL:ma

Enclosure

cc: State Clearinghouse ✓
bc: Wally Hibbard
Frank Stiles
Hazel Stevens



OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

STATE CLEARINGHOUSE

Intergovernmental Relations Division
306 State Library Building, Salem, Oregon, 97310
Phone Number: 378-3732

P.N.R.S. STATE REVIEW

RECEIVED
DEC 10 1979
DIVISION OF STATE LANDS

Project #: 7912 4 140

Return Date: 1-18-80

ENVIRONMENTAL IMPACT REVIEW PROCEDURES

If you cannot respond by the above return date, please call to arrange an extension at least one week prior to the review date.

ENVIRONMENTAL IMPACT REVIEW DRAFT STATEMENT

- ☐ This project has no significant environmental impact.
- ☐ The environmental impact is adequately described.
- ☒ We suggest that the following points be considered in the preparation of a Final Environmental Impact Statement.
- ☐ No comment.

Remarks

The application of herbicides will have minimal effect on evergreen species, the statement in paragraph two that all woody vegetation species will be defoliated is a misnomer.

Also we recommend hand removal of vegetation particularly within 200 feet of any designated aquatic buffer zone.



OREGON PROJECT NOTIFICATION AND REVIEW SYSTEM

STATE CLEARINGHOUSE

Intergovernmental Relations Division
306 State Library Building, Salem, Oregon, 97310
Phone Number: 378-3732

Original
JAN 28 1980

P N R S S T A T E R E V I E W

Project #: 7912 4 140 Return Date: 1-18-80

ENVIRONMENTAL IMPACT REVIEW PROCEDURES

If you cannot respond by the above return date, please call to arrange an extension at least one week prior to the review date.

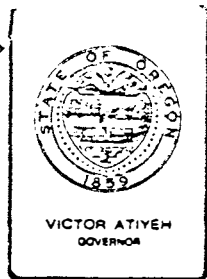
ENVIRONMENTAL IMPACT REVIEW DRAFT STATEMENT

- () This project has no significant environmental impact.
- () The environmental impact is adequately described.
- () We suggest that the following points be considered in the preparation of a Final Environmental Impact Statement.
- (X) ~~No~~ comment.

see attached

Remarks

Agency Forestry By *[Signature]*



Forestry Department

OFFICE OF STATE FORESTER

2600 STATE STREET, SALEM, OREGON 97310 PHONE 378-2560

January 25, 1980

Mr. John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621-SJ
Portland, Oregon 97208

Dear Mr. Kiley:

We appreciate the opportunity to review your Proposed Final Year 1981 Program Draft Environmental Impact Statement (DEIS). Our Forest Resource Study team would like to make the following comments.

First, the BPA's Fiscal Year 1981 Proposals require the permanent removal of 1,400 to 1,900 acres of forest land from timber production. Removal of this forest land from timber production is in direct conflict with the Board of Forestry's policy to conserve Oregon's commercial forest land base. In the Forestry Program for Oregon, the Board of Forestry has recognized that the key to assuring an adequate timber supply in the future, especially with the predicted 22% decline in timber harvest volumes by the year 2000 (Timber for Oregon's Tomorrow), is the conservation of the forest land base. Only with this conservation of the forest land base can we be assured of adequate timber supply to meet the future economic and social needs of the people of Oregon.

The Oregon State Department of Forestry strongly recommends that the BPA take a closer look at alternative proposals which will not remove forest land from timber production.

Second, Alternative B, for the Allston-Portland Area Reinforcement, calls for the construction of a 500 kV line from the Allston Substation to Keeler Substation. This line could parallel an existing line which passes through several miles of Oregon State Department of Forestry owned lands and would require the widening of the existing route.

The Department of Forestry finds alternative B to be very unsatisfactory. Construction of these lines will have two major impacts. First, the widening of the existing route will remove high site forest lands from timber production. Second, the presence of these lines will severely

constrain our ability to effectively manage the adjacent forest lands. Harvest, by a cable logging system, will be impossible on the area bordering the right-of-way route. Tractor logging would be possible in these areas, however, this system has potentially adverse environmental effects and therefore is not a feasible alternative.

The Oregon State Department of Forestry does not feel that it can afford to lose this much forest land and recommends that the BPA consider an alternative proposal which will not require the widening of the existing route through lands owned by the Department of Forestry.

Third, and last, the Department of Forestry feels that the long and short-term economic impacts of removing these 1,400 to 1,900 acres of forest land from timber production have not been adequately discussed. It is stated in the DEIS that "Timber from these forest lands plays an important and sometimes dominant role in the economics of the communities and counties of both states (Oregon and Washington), creating jobs, payrolls and taxes" (p. 13 of Draft Facility Planning Supplements: Allston/Portland Area Service). However, no attempts have been made in the DEIS to quantify the impact of removing these acres from production. How much will forestry related employment be decreased and what decrease in tax revenues can each county expect from the permanent removal of this timber? Since the BPA is considering the permanent removal of forest land, what are the long term economic impacts of not having a sustained timber flow from these lands?

The Oregon State Department of Forestry requests an adequate discussion of the long and short-term economic impacts of the removal of these 1,400 to 1,900 acres of forest land on local employment and county revenues, and a discussion of alternative routes which would have fewer impacts upon the forest land.

Sincerely,

H. MIKE MILLER
State Forester


BY: Sue Joerger
Forest Resource Staff Assistant

SJ:lp
4209B
cc: State Clearinghouse (79124-140)
Carl Smith
Pat Amedeo
Bill Phelps

Metropolitan Service District

527 SW Hall Portland, Oregon 97201 503/221-1646

January 29, 1980

Mr. John Kiley
Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Kiley:

Re: Areawide Clearinghouse Review
Bonneville Power Administration Draft Environmental
Impact Statement For Fiscal Year 1981 Program
Metro File #7912-4

Circular A-95 Revised of the Federal Office of Management and Budget requires Areawide Clearinghouse review of numerous federally assisted projects. Metro serves as the designated Areawide Clearinghouse for the Portland metropolitan area. The primary purpose of this review is to assure coordination of proposed projects with state, area-wide and local plans and policies. This assists the federal agencies to allocate our federal tax dollars in a way that is as consistent as possible with local views.

The Draft Environmental Impact Statement on the above referenced project has been reviewed by Metro staff and interested jurisdictions and agencies within the region. It has been determined that the proposal does not violate any adopted regional plans or policies and appears to be consistent with existing local plans and policies.

Please note the enclosed comments from Clackamas County which indicate that installation of new power lines within the County will require specific reviews.

Rick Gustafson,
Executive Officer

MSD Council

Mike Burton,
Presiding Officer
District 12

Donna Stuhr,
Deputy Presiding
Officer
District 1

Charles Williamson
District 2

Craig Berkman
District 3

Corky Kirkpatrick
District 4

Jack Deines
District 5

Jane Rhodes
District 6

Betty Schadeen
District 7

Caroline Miller
District 8

Cindy Banzer
District 9

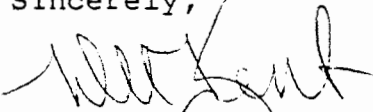
Gene Peterson
District 10

Marge Kafoury
District 11

Mr. John Kiley
January 29, 1980
Page 2

If we can be of further assistance in processing this matter, feel free to call upon us.

Sincerely,



Denton U. Kent
Chief Administrative Officer

DUK:LB:ss
6793/D5

cc: U.S. Department of Energy

Enclosure



METROPOLITAN SERVICE DISTRICT

527 S.W. HALL PORTLAND, OREGON 97201 503/221-1646

TO: Clackamas County
FROM: Linda Brentano, A-95 Coordinator
SUBJECT: BPA FY 81 DEIS
FILE NUMBER: 7912-4

DATE: 14 DEC 79 RETURN TO MSD BY: 28 DEC 79

The attached proposal is provided to you for your review and comment as called for in OMB Circular A-95 Revised. Please notify us immediately if you will not be able to respond by the above indicated date. We need your response so that the staff and committees can utilize your comments in their recommendation to the funding agency.

Please do not hesitate to ask if you require further assistance or information on the proposal. Detailed project descriptions are available by contacting the MSD office or the applicant agency.

TYPE OF REVIEW

- () PROGRAM REVIEW AND COMMENT
(X) ENVIRONMENTAL REVIEW AND COMMENT
() OTHER

YOUR RESPONSE

- () IT HAS NO SIGNIFICANT EFFECT AND WE HAVE NO COMMENT.
() IT HAS NO ADVERSE EFFECTS AND WE APPROVE.
() IT HAS ADVERSE EFFECTS AND WE DISAPPROVE (PLEASE COMMENT)
(X) WE ARE INTERESTED BUT REQUIRE MORE INFORMATION.
() ADDITIONAL COMMENTS FOR PROJECT INFORMATION, OR IMPROVEMENT.

EXPLANATION AND COMMENTS (FOR ADDITIONAL SPACE, PLEASE USE THE BACK OF THIS PAGE.)

Installation of new power lines will need specific reviews as it traverses Clackamas County. Plan "B" would result in more impact on Clackamas County than Plan "A".

DATE December 19, 1979

AGENCY Clackamas County

Alan Sherk
Chairman

Jan. 30, 1980

John Kiley, Environmental Manager
Bonneville Power Administration
P.O. Box 3621 - SJ
Portland, Oregon 97208

Dear Mr. Kiley:

After attending your meeting in January at the Rainier Grade School, receiving your material, and knowing the area your Plan B would use for the reinforcement line going through Columbia County, I have come to the following conclusions:

1. You have disregarded one of Oregon's planning goals which is to preserve agricultural and forestry lands. Your line cuts through some of the most prime timber land in the world and renders it useless.
2. On page 8, para. 5, of your Allston-Portland report you state that "the majority of the forest vegetation in the study area is in the Tsuga Heterophylla (Western Hemlock) vegetative zone" which is in error. Douglas Fir is the dominant species, and this fact is not due "to extensive logging in recent years". What are you trying to say in this paragraph? Fir is the dominant species in Columbia County. Fir is the dominant species now growing on the line. The percentage of hemlock is low, from 1-5%. Since hemlock is the lowest valued log for lumber, are you trying to downplay the value of the land rated for growth potential as well as the value of the timber?
3. On page 12, I think you had better check your growth cubic feet/acre/year chart again. This is some of the finest timber land in the world.
4. In speaking with land owners on whose lands you have existing lines, I can't help but come to the conclusion that you have a shoddy track record. Your people even told one land owner who has over one mile on your line on his land that if there ever was another line put through his property it would go on the poles they were proposing to build at that time. They claimed the poles were built to handle more lines for more power load. Is lying to landowners the way you conduct your business?

However, the major issue is the forest land base which cannot be violated with any more power lines which destroy its growth potential.

cc: Sen. Mark Hatfield
Sen. Robt. Packwood
Rep. Les AuCoin
Rep. Bob Duncan
Jim Brown, O. S. Forestry
Dr. Robt. Erickson

Sincerely,
Roger Nichols
Roger Nichols
President, Col. Co. Small
Woodlands Assoc.

Route 3, Box 3308
Rainier, OR 97048

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

January 31, 1980

NORTHWEST REGION
FAA BUILDING KING COUNTY INT'L AIRPORT
SEATTLE, WASHINGTON 98108



Mr. John Kiley
Environmental Manager
Bonneville Power Administration
P. O. Box 3621 SJ
Portland, Oregon 97208

Dear Mr. Kiley:

We have reviewed the draft EIS for your proposed Fiscal Year 1981 program and submit the following comments:

Due to the scale and schematic nature of the drawings in the draft EIS, it is difficult to determine the potential impact of the proposed transmission lines on the airports, and air navigation and landing aids near the path of these lines. New transmission line siting maps should be provided for our review. Notification to us is required in advance of construction in accordance with Federal Air Regulation Part 77.

There may be adverse effects on the enroute and terminal air navigation system both during the construction and operation phases of the program. The degree of interference will depend on the specific routes the power lines take.

Fixed equipment or construction equipment working within restrictive areas or penetrating certain vertical angles or antennas at facilities such as VHF Omni Ranges/Tactical Air Navigation Equipment, Radar Microwave Link Repeaters and Air Route Surveillance Radars, could interfere with the radiated signal and render the facility unusable. If this occurs, it will necessitate shutdown of the affected facilities. If the Bonneville program includes fixed equipment that causes this interference, it will necessitate our relocating our facilities that are affected.

If the specific routes of power lines pass through our leased or restrictive areas, it will be necessary for the power company to obtain easements, or permission from us, as well as maintain close coordination with us during construction so that shutdown of affected facilities may be arranged on a timely basis.

If there are further questions regarding these comments, feel free to contact me on (206) 767-2607 or FTS (8) 396-2607.

Sincerely,

A handwritten signature in cursive script, appearing to read "Dale F. Backman", is written over the typed name.

DALE F. BACKMAN
Chief, Appraisal and Planning Staff

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101



REPLY TO
ATTN OF:

M/S 443

FEB 1 1980

John Kiley, Environmental Manager
Bonneville Power Administration
U.S. Department of Energy
P. O. Box 3621--SJ
Portland, Oregon 97208

Dear Mr. Kiley:

We have completed our review of your recently issued Draft Environmental Impact Statement on BPA's proposed Fiscal Year 1981 Construction and Maintenance Program. We have also completed our review of the appended Draft Facility Planning Supplement for the Allston-Portland Area Reinforcement project (Study Area 80-1).

We found that each of the documents provided a generally good description of the potential environmental consequences of BPA's proposed FY 1981 program. The Allston-Portland Area Reinforcement provided a good picture of the alternative plans of service under consideration and of the differences between the affected environments of the two alternative service plans.

However, it is possible that, by providing more detail, the Draft Facility Planning Supplement might have provided the reader with a better picture regarding which potential plan of service has the potential for producing the fewest adverse environmental consequences. Additionally, it is our understanding that BPA is considering a third alternate plan of service. This alternative plan, which is a modification of "Plan A", should be evaluated in the Final Facility Planning Supplement.

Based on our review of these environmental documents we have rated them LO-1 (LO - Lack of Objections to the proposed action, 1 - adequate information). This rating will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions in accordance with Section 309 of the Clean Air Act, as amended.

Sincerely,

Roger K. Mochnick, Acting Chief
Environmental Evaluation Branch

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
P.O. Box 2417
Washington, D.C. 20013

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JAN 30 1980 Date	



Administrator
Bonneville Power Administration
U. S. Department of the Interior
P. O. Box 3621
Portland, Oregon 97208

Dear Sir:

We have reviewed the Draft Environmental Impact Statement for the Bonneville Power Administration's Proposed FY 1981 Program and have the following comments.

There should be a provision in the EIS for further coordination with the Forest Service and other agencies on a more site-specific basis.

Herbicides

The EIS needs to incorporate the new Forest Service Manual herbicide amendment (FSM 2100, Amendment No. 10, (10/79) (copy enclosed)) in the proposal. It will be necessary for BPA to submit a request for any proposed use of herbicides on National Forest System land. This request should be accompanied by an environmental assessment (Forest Service Manual 1950, enclosed) prepared by BPA and sent to the responsible Forest Service official. These documents should be sent to the Forest Service headquarters office responsible for administration of the National Forest lands involved.

We feel that BPA has properly displayed and analyzed use of herbicides in the treatment of foliage; however, we feel they did not adequately handle the prevalent public controversy concerning use of herbicides.

It is mentioned several times that spraying (aerially) will be no closer than 100 feet to streams or bodies of water. We suggest some qualifier might be added to that such as; "or as otherwise agreed with land manager or owner."

2.

Rights-Of-Way Maintenance

Maintenance of rights-of-way for transmission lines and access roads should be covered in the EIS. It would be easier to follow proposed maintenance work if the EIS referenced the BPA-FS Right-of-Way Management Plan for each line and Forest.

We appreciate the opportunity to review and comment on the FY 1981 Proposed General Management Program.

Sincerely,



PHILIP L. THORNTON
Deputy Chief

Enclosures



STATE OF
WASHINGTON

Dixy Lee Ray
Governor

WASHINGTON STATE ENERGY OFFICE

400 E. Union-1st floor, Olympia, Washington 98504

206/754-1350

February 1, 1980

Mr. Sterling Munro, Administrator
Department of Energy
Bonneville Power Administration
PO Box 3621
Portland, OR 97208

Dear Mr. Munro:

SUBJECT: Review of Draft Environmental Impact Statements

Because of limited staff and budget resources, our office regretfully must discontinue review of Environmental Impact Statements at this time. Should the situation improve, we will again provide what I consider to be an important review function.

Sincerely,

A handwritten signature in cursive script that reads "Jack O. Wood".

Jack O. Wood
Director

JOW/dsc

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
324 25th Street
Ogden, Utah 84401

OFFICIAL FILE COPY	
No.	Date FEB - 4 1980
Referred To:	
Action Taken:	
<input type="checkbox"/> ANS.	<input type="checkbox"/> NO REPLY
By	Date

1950
2800

JAN 31 1980



Mr. Ray Foleen
Acting Administrator
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Foleen:

Thank you for sending us a draft copy of the EIS for Bonneville's proposed Fiscal Year 1981 program of work.

After a review by our Regional Office personnel, we have only one comment. This concerns your proposed right-of-way management treatment on the Swan Valley-Teton transmission line passing through the Driggs District of the Targhee National Forest.

Prior to any further planning for hand cutting or herbicide treatment with Tordon 101, your maintenance supervisor at Idaho Falls should contact the Forest Supervisor, Targhee National Forest, at St. Anthony, Idaho.

The Forest Supervisor of the Targhee National Forest will want to closely work with your maintenance personnel so that adequate preplanning and monitoring of the use of Tordon 101 can be obtained. It will be necessary for the Forest to receive approval for use of Tordon on the National Forest through our Regional Pesticide Use Committee.

Thank you for the opportunity to review your EIS.

Sincerely,

RICHARD K. GRISWOLD
Director
Planning and Budget

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Flathead National Forest, Box 147
Kalispell, MT 59901 (406) 755-5401

LATE LETTER

Administrator, Dept. of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

Ref. Draft F.Y. 1981
FEIS

OFFICIAL RECORD	
No.	Date
	FEB 8 1981
Return To:	
Action	2720
CLAS.	2720
DATA	2720



Dear Sir:

We have routed your Draft Environmental Impact Statement for F.Y. 1981 to our staff specialists for review. Their overwhelming comment was the apparent lack of energy "conservation" as a major B.P.A. thrust in F.Y. 1981. Instead, the emphasis appears to be business as usual, with maintenance and construction projects based on continued increased energy demands. B.P.A. needs to take steps to encourage--perhaps demand--conservation. The environmental and political consequences of failing to do this becomes more apparent each day. B.P.A. should provide national leadership in energy conservation.

On page 24, at the bottom of the page, the D.E.I.S. refers to B.P.A. standards governing use and application of herbicides. You need to insure that your herbicide standards conform to U.S. Department of Agriculture and E.P.A. standards.

The herbicide reference cited on the bottom of page 25 is 10 years old. There is a considerable amount of more current literature.

Your proposal to continue disposing of slash through burning needs to be re-examined. This type of deliberate reduction in air quality, coupled with a waste of BTU's, needs to be changed in the near future. Changes probably cannot be implemented in F.Y. 1981, but B.P.A. needs to begin seeking alternative means of slash utilization.

We appreciate the opportunity to review this document.


J. L. EMERSON
Forest Supervisor

**REGIONAL PLANNING COUNCIL
OF CLARK COUNTY**

1408 Franklin St. p.o. box 5000
Vancouver, Wash. 98663
phone 1 206 699-2361

Executive Director
Richard T. Howsley

LATE LETTER

February 8, 1980

Mr. John Kiley
Environmental Manager
Bonneville Power Administration
P. O. Box 3621 - SJ
Portland, OR 97208

Dear Mr. Kiley:

Re: Draft EIS, BPA Proposal FY 1981
Program and Facility Planning Supplement

We have reviewed the above-referenced EIS and have the following comments.

Herbicide residue monitoring information is not presented for Tordon 101, which is proposed for use on the North Bonneville-Ross No. 1 transmission line in Clark County. Is such data available? Why is such data presented for 2-4-D, Dicamba, and Picloram as a potassium salt, and not for Picloram as the trichloropandamine salt?

The EIS notes that high-voltage power lines produce ozone. The southern part of Clark County is designated an ozone nonattainment area by EPA. Any production of ozone would adversely impact local efforts to attain National Ambient Air Quality Standards.

We have enclosed a copy of the Clark County Comprehensive Land Use Plan Map for your information. The text of the Plan and the proposed zoning ordinance to implement the Plan, are available on request.

We would request that you consult with the Regional Planning Council Preservation Planner, Mr. Kirby Turner, during the development of the Location Phase Draft EIS regarding historic and archaeological sites.

February 8, 1980
Mr. John Kiley
Page Two

LATE LETTER

Stream crossings in the County may require substantial development permits, in accordance with the County's Shoreline Master Program.


We would be very interested in receiving any documents regarding biological impacts of 500-kV transmission lines.

The proposed alternative A transmission route does impact commercial aggregate resources in two areas of the County: (1) the Mill Plain area (Section 30 of T2N R3E W. M., and surrounding area), and (2) the crossing of the East Fork of the Lewis River.

The East Fork of the Lewis River is identified as critical wildlife habitat by the Corp of Engineers, as are the areas adjacent to the Columbia River at Kalama.

We appreciate this opportunity to comment on the Draft EIS and Facility Planning Supplement. We hope these comments are of assistance to you in preparing the Final EIS and the Location Phase Draft EIS.

Sincerely,


Terry Oliver
Planner

TO/mf22.4B15

Encl.



NPDEN-WM

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208

OFFICIAL FILE COPY	
No.	Date
	FEB 15 1980
Referred To:	
Action Taken:	
<input type="checkbox"/> ANS.	<input type="checkbox"/> NO REPLY
8 February 1980	

Mr. Sterling Munro, Administrator
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

LATE LETTER

Dear Mr. Munro:


This is in response to the Acting Administrator's letter of 4 December 1979, requesting our review of your Draft Environmental Impact Statement on your Fiscal Year 1981 Proposed Program.

We feel that a comment on the proposed (1989) southwest intertie is appropriate (referenced in your Draft EIS Figure 1--BPA Main Grid Additions, and page 4--Draft Facility Planning Supplements). Although the intertie is not directly addressed as part of the FY 1981 program, it is being considered in the planning and development of those facilities that are in the program. The utility of the intertie will be impacted by thermal energy resources whose schedules continue to slip. We believe that no facilities, whether they be the intertie or FY 1981 program, should be planned on the basis that the Federal hydroelectric projects will make up the projected thermal deficiencies.

The Bonneville Power Administration will be required to obtain a permit from the Corps of Engineers for the location of any transmission lines on Corps' project lands. Also, a Section 10 permit would be required for any transmission lines crossing navigable waters. A Section 404 permit would be required for any work involving the discharge of dredge or fill material in the waters of the United States, including adjacent wetlands.

We appreciate the opportunity to review and comment on the Draft EIS.

Sincerely,


ROBERT L. CROSBY
Colonel, Corps of Engineers
Deputy Division Engineer

BEFORE THE BOARD OF COUNTY COMMISSIONERS

FOR COLUMBIA COUNTY, OREGON

IN THE MATTER OF OBJECTING TO)
 BONNEVILLE POWER ADMINISTRATION'S)
 PROPOSAL TO CROSS PORTIONS OF)
 COLUMBIA COUNTY WITH NEW POWER)
 LINES AND TOWERS)

No. 22-80

RESOLUTION

WHEREAS, it appearing to the Board that on January 17, 1980, Bonneville Power Administration held a public hearing in the City of Rainier, Columbia County, Oregon, for the purpose of receiving testimony relative to placement of new 500 KV powerline crossings, and

WHEREAS, Bonneville Power Administration has proposed two plans, one being that said powerline crossings be through Columbia County, and the other that they go through counties in the State of Washington, and

WHEREAS, if said powerline crossings were to be placed in Columbia County, this would have an adverse affect on Columbia County's timber resources as well as the taxpayers of Columbia County, and objections have been expressed by both public bodies and private citizens relating to said proposal, now therefore, be it hereby

RESOLVED that the Board of County Commissioners for Columbia County, for and on behalf of the citizens and taxpayers of Columbia County, do hereby object to said proposal by Bonneville Power Administration to cross portions of Columbia County with new power lines and towers.

DATED at St. Helens, Oregon this 13th day of February, 1980.

BOARD OF COUNTY COMMISSIONERS
 FOR COLUMBIA COUNTY, OREGON

Chairman

Marion Sahagian
 Commissioner

Jeff Albarran
 Commissioner

Columbia County Board of Commissioners
 331 Courthouse
 St. Helens, Oregon 97051

UNITED STATES GOVERNMENT

Memorandum



DATE : February 29, 1980

In reply
refer to : OPE

TO : Jack Kiley
Environmental Manager -- SJ

FROM : Robert J. Gilbert
Portland Area Engineer -- OPE

SUBJECT: EIS Comments from Birkenfeld-Mist Citizens Public Advisory Committee

Attached for your review are the comments of the Birkenfeld-Mist Citizens Public Advisory Committee on the EIS - Proposed Fiscal Year 1981 Program.

These comments were received by Area Engineering on February 28, 1980.

1 Attachment:
Mist-Birkenfeld Comments

RJGilbert:ej

cc:
Official File - OPE



Department of Energy
Bonneville Power Administration
Portland Area Office
P.O. Box 3621
Portland, Oregon 97208

In reply refer to: OPE

January 23, 1980

Robert Van Natta, Chairman
Birkenfeld-Mist Citizens' Public
Advisory Committee
Route 1, Box 560
Rainier, Oregon 97048

Dear Mr. Van Natta:

During our public meeting in Rainier, Oregon, on January 17, 1980, covering the Fiscal Year 1981 EIS for the Bonneville Power Administration Maintenance and Construction Program, we were advised that your committee did not have a copy of the statement. Enclosed is this Environmental Impact Statement.

The close of the comment period would normally be January 31, 1980. However, since your committee has not reviewed this statement, we can accept your comments until February 15, 1980.

If you have any questions, please call us at 234-3361, Extension 5235.

Sincerely,

Robert J. Gilbert
Portland Area Engineer

1 Enclosure:
FY-81 EIS Book

cc:
Bryan Christian, Director
Columbia County Planning Dept.
St. Helens, Oregon 97051

AREA ENGINEER	
PORTLAND AREA	
<input checked="" type="checkbox"/>	GILBERT
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Attached please find 9. written comments from the mist Birkenfeld c'doc R. Van Natta

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 1

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: We have reviewed the letter of State Forester H. Mike Miller dated January 25, 1980, a copy of which is attached herewith for reference and we approve of the observations and conclusions therein stated.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 2

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: Page 8 of the DFPS Alston-Portland area reinforcement SA30-1 states "the majority of the forest vegetation in the study area is in the Tsuga Heterophylla (Western Hemlock) Vegetative Zone. . . although Western Hemlock is the climax species in this zone Douglas Fir is the major species due to extensive logging in recent years".

While it may be technically true from a biological sense that the Keeler-Alston line area is in a Western Hemlock Vegetative Zone in that this would be described as a climax species, the more accurate fact is that for all practical purposes, this area is a Douglas Fir zone not because of extensive recent logging but rather because in this area Western Hemlock does not overtake the fir for 500 to 1000 years. Examination of stumps of the old growth timber removed 50 years ago reveal that a majority of the old growth in the Keeler-Alston line area was three to five hundred years old and was Douglas Fir. Assuming the power line usefulness of fifty years as is suggested elsewhere in the impact statement, the Keeler-Alston area must be regarded as Douglas Fir ground.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 3

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: With respect to the DFPS Alston-Portland area reinforcement SA80-1 it is observed that bald eagles are known to occur along the Columbia River near where it would be crossed by the proposed alternatives.

This statement is in error or at least misleading to the extent that bald eagle have been identified throughout the area through which the alternative lines might pass and possible interference with the eagle habitat is not limited to the area immediately adjacent to the Columbia River, but rather eagles may be found, although rarely, in the higher elevations where the Keeler-Alston line would run as well as at the lower elevations adjacent to the river.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 4

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: On page 12 of the DFPS Alston-Portland area reinforcement SA80-1 statement it is suggested that the forest lands through which the Keeler-Alston line would pass could be expected to have a mean annual growth of 85 cubic feet per acre per year on a 60 year life cycle. This figure grossly understates the actual productive capacity of the ground involved. The land in the Keeler-Alston study area is characterized by what foresters would call low site 2 or high site 3 ground. Unmanaged, the land may be expected to produce 125 cubic feet per acre per year on a 40 year cycle and intensive forest management practices, which are now becoming increasingly common such as thinning and fertilization, could be expected to double this productive amount.

This committee notes that Plan B which calls for paralleling the Keeler-Alston line would impact 53 miles of forest land as opposed to only 30 miles of Plan A and the committee is concerned that understatement of the forest potential would lead to a failure to recognize the magnitude of the difference in the forest impact between Plans A and B.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 5

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: With respect to page 15 of the DFPS Alston-Portland area reinforcement SA80-1 it is observed that under urban and residential impacts that Plan B goes through three miles of urban and residential area whereas Plan A goes through 20 miles of urban and residential area. This statement fails to note that the Keeler-Pearl (Wilsonville) extension, which is a part of the overall plan if the Keeler-Alston line is built, runs through Aloha and onto the Wilsonville area which comprises some of the most rapidly developing urban residential area in the entire State of Oregon.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 6

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: On page 15 DFPS Alston-Portland area reinforcement SA80-1 various recreational impacts are enumerated. Among the things that are not enumerated is the fact that the Keeler-Alston proposal Plan B would create an additional visual impact on the Camp Wilkerson Park Natural Area.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 7

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: On page 19 of the DFPS Alston-Portland area reinforcement SA80-1 on vegetation it is observed that tansy ragwort could cause a severe weed problem as a result of clearing. A more accurate statement on the weed problem is that it will cause a severe weed problem.

On the same page it is also observed that "impacts on forest land, therefore, are more serious than for any other broad vegetation type".

This is actually an understatement. The fact is that forest land utilized for right of way loses all economic value because the land is not cleared in such a way that it can be converted to any other use such as an agricultural use. This impact could be mitigated somewhat if the right of way clearing operations were performed in such a manner that the land could be converted to agricultural purposes.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Comment No. 8

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: On page 23 of the DFPS Alston-Portland area reinforcement SA80-1 under demographic and economic impacts it is concluded that the impacts of the project will probably be low and short termed. Such a conclusion is not exactly accurate. Removal of as much as 1900 acres of prime forest land from the forest land base as proposed by the Keeler-Alston line will permanently deprive the economy of Columbia County of annual forest production sufficient to support one or more modest sized logging companies and since there exists a substantial multiplier effect between basic industry jobs and the support and service industry jobs which necessarily flow from the existence of the base jobs, the demographic and economic impact could more accurately be described as moderate and long term as it would continue for the life of the line and such time thereafter as may pass until the right of way is reforested.

COMMENT ON PROPOSED FINAL YEAR 1981 PROGRAM DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Comment No. 9

COMES NOW the Mist-Birkenfeld Citizens Advisory Committee and does comment on the above referenced Environmental Impact Statement as follows: On page 24 of the DFPS Alston-Portland area reinforcement SA80-1 it is observed that there will be a one time increase in timber yield taxes. This statement is quite true. However, it should be clarified that thereafter there will be a permanent long-term reduction in timber tax revenues which will be significantly greater on Plan B than on Plan A by virtue of the fact that Plan B goes through much more forest land.



RESPONSE TO COMMENTS

X. RESPONSE TO COMMENTS

Because the final Allston-Portland Facility Planning Supplement has been delayed and is not being issued with this statement as was the draft, the following responses do not address those comments that specifically refer to the Allston-Portland transmission proposal. All relevant comments will be accommodated in the separate Allston-Portland final supplement when it is issued.

A. FRIENDS OF THE EARTH, DECEMBER 19, 1979

Comment: On page 49 of the report, it is stated: "The herbicides listed by BPA and listed in Table 4 or very low in toxicity to animals and humans." I looked at Table 4, and all the herbicides noted are poisons and in fact produce very serious health effects at doses used.

Response: BPA does not mean to imply that the chemicals listed are not toxic, only that their toxicity is low. Many household items are also toxic (table salt, aspirin, vitamins, oven cleaner, household ammonia, etc.). This does not mean that they cannot be used safely. The same holds true for the herbicides proposed for use by BPA. Furthermore, the actual exposure of humans and animals to herbicides that would be used by BPA is so low that the possibility of any toxic effects is virtually eliminated. All of the herbicides used by BPA are approved by the Environmental Protection Agency (EPA). See section IV.B.2.b.

Comment: We have had complaints from several parts of the nation about how exposure to 2,4-D caused people to lose their babies. This fits well with laboratory data, showing that 2,4-D causes bleeding both in the adult human and also in all the organs of the fetus.

Furthermore, picloram has been found to be a solid cancer causing chemical, with severe impact upon many body organs, as you can see from the enclosed study by Dr. Melvin Reuber of the Frederick Cancer Research Center (part of NIH).

We hope that you can revise this section to accurately reflect what is known about these chemicals. For example, the U.S. Forest Service presently believes that 2,4-D is so dangerous that they have issued new regulations to curtail its use. Secondly, Forest Service managers believe that picloram "is a really tough chemical." A lot of people are injured by it.

Response: Laboratory tests have produced mixed conclusions regarding the effects of 2,4-D on reproduction. Most tests have shown, however, that large and prolonged doses are generally required to cause significant biological effects in humans.

BPA use of 2,4-D and other EPA approved herbicides would present minimal health hazard because: (1) BPA would not use herbicides at greater than the recommended rate; (2) inadvertent contamination would

be minimized by measures such as buffer strips; and (3) BPA would use relatively minor amounts over a large geographic area.

The EIS has been revised to summarize the current literature analyzing the herbicides proposed for use, including the paper by Dr. Reuber; see section IV.B.2.b.(3)(c)2.h.

The USFS has revised portions of the Forest Service Manual giving more specific direction on the use of 2,4,5-T or other herbicides containing TCDD (BPA does not use 2,4,5-T). In addition, the revisions in the USFS Manual give more specific direction to the use of 2,4-D even though it contains no TCDD. Primarily, the directions specify definite distances from treatment zones to water supply and human habitation. Without knowing the source and context of the USFS statements regarding picloram, it would be difficult for us to comment. Picloram is still listed in the USFS Manual (Exhibit 1, 2158.2-3).

Comment: You know as well as I that it is impossible to apply herbicides from the air without trespassing upon property owners all along the right-of-way.

Response: BPA is ususally able to avoid application to nontarget areas through the following measures:

1. adding drift control agents to the herbicides mix;
2. application only during early morning hours when the air is still;
3. leaving buffer zones along the edge of the right-of-way and
4. using observers with radios at each end of the aerial pass to report on any change in windspeed and direction.

Past experience has proven these methods to be effective. See section IV.B.2.b.(2)(a).

Comment: As you may know, selective brush management is less expensive, than herbicide spraying, reducing annual costs by about 75 percent.

Response: The term "selective brush management," as it is commonly used, refers to the selective application of herbicides to individual target species (trees that can ultimately grow tall enough to be hazardous to the powerline). This is in contrast to blanket application, which involves spraying everything within a given area. Aerial application is an example of blanket application. Ground spraying may also involve blanket application. The selective application of herbicides from the ground is significantly less costly than blanket application from the ground, although nowhere near 75 percent. The most costly means of control is hand or mechanical cutting. See section II.B.

Comment: The President in his message of 1979 stressed integrated pest management, and directed agencies to develop programs. I think that your environmental impact is basically a slap in the face to the President, since it contemplates ignoring what can be done to save money with selective brush management.

Response: As stated in the draft EIS, BPA proposes to use a number of methods to control vegetation within its transmission rights-of-way. Of the total acreage scheduled for treatment by BPA in FY 1981, only 20 percent would involve aerial application of herbicides; 9 percent of the program would be accomplished by means of hand and mechanical cutting; and the remaining 71 percent would employ selective ground application of herbicides. The method employed in each particular situation is dictated by accessibility, economic factors, and environmental considerations. Furthermore, as stated in the draft EIS, BPA's vegetation management program is aimed at the conversion of vegetative cover by controlling tall-growing species while simultaneously encouraging lowgrowing species to flourish and spread. Because BPA's vegetation management program would use multiple control techniques, it is consistent with the President's policy on integrated pest management. See section II.B.5. for BPA's vegetation management proposal.

B. U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE,
JANUARY 22, 1980

Comment: Any maintenance program, particularly spraying of rights-of-way, should be correlated with private landowners using those lands for grazing purposes. Long-range plans should be developed so grazing and spraying would not be in conflict.

Response: When herbicides are used that have label restrictions on grazing of meat and dairy animals in treated areas, BPA contacts the owners and occupants of the areas to be treated. See section II.B.4. of the EIS for further discussion on this policy. Grazing is generally compatible with BPA rights-of-way, and conflicts arising from the use of herbicides are short term.

C. U.S. DEPARTMENT OF THE INTERIOR, PACIFIC NORTHWEST REGION,
JANUARY 25, 1980

Comment: The DES is unclear as to the extent to which the visual value of undeveloped land, as opposed to economic and other considerations, is considered in deciding the necessity of new rights-of-way. We therefore suggest an additional alternative in the final statement, wherein maximum possible use is made of existing corridors. Discussion of the alternative should include an analysis of disadvantages, including increased costs, and should weigh these against the public benefits of not constructing new facilities in undeveloped and agricultural areas.

Response: For new transmission lines, it is BPA policy to plan for their construction parallel to existing lines where practicable. In developing a plan of service, this is often the environmentally preferable alternative. However, paralleling is not always practicable and may have greater overall adverse environmental impact. Preliminary planning indicates that approximately 192-210 miles (307-336 km) of new transmission line may be located parallel to existing lines. Closer analyses of the advantages and disadvantages of paralleling will be done site-specifically. Unquantified environmental amenities and values, including the visual value of undeveloped land, will be given appropriate consideration in decisionmaking along with economic and technical considerations. See section IV.A. for a discussion of paralleling.

Comment: The discussion of mitigation of problems created by proposed line changes is considered to be too brief in some instances. Two examples are roadways for construction and potential pollution of water sources.

Response: The discussions of construction impacts and mitigation measures in sections II.A.1.b. and IV.A. apply to the upgrading of existing lines as well as new construction, but on a lesser scale.

Comment: The proposed program could be strengthened by including provisions for water-quality monitoring of surface and ground-water sources draining vegetation management areas and storage areas for electrical components containing polychlorinated biphenyls (PCB).

Response: Under the proposed vegetation management program, BPA would periodically monitor the fate and persistence of applied herbicides. See section II.B.5. BPA's PCB storage facility is designed to prevent environmental contamination in case of a leak or spill. See section IV.B.1. BPA does not intend to monitor the surface or ground water there.

Comment: The draft statement should consider, at least in a general manner, the potential for secondary impacts from increases in irrigation as a result of the availability of additional power.

Response: At this level of planning such impacts are not reasonably foreseeable. Discussion of such impacts would be included in the appropriate site-specific environmental analysis.

Comment: Although general impacts to fish resources are discussed, it should be mentioned that many of the potential impacts may occur to anadromous species of tremendous value to sport and commercial users. Furthermore, the bulk of the impact will occur in a system (Columbia River and tributaries) that already has suffered repeated adverse modifications from water development projects. Other highly valued resident species occur in the project area and may suffer impacts from the proposed actions. We believe this section should be expanded to address these issues.

Response: Section IV.A.2.b.(2)(a) in the final EIS has been revised to reference anadromous fish species. Potential impacts to these species from the proposed program are minor and an extensive analysis of impacts to these fisheries is not within the scope of this EIS.

Comment: This discussion on impacts to wildlife is misleading and incomplete. The most severe loss of wildlife populations will occur from habitat loss and modification and not increased hunting pressure through increased access. The statement that minimal impacts will occur to wildlife in farmland and previously disturbed areas is an unfounded generalization. Major populations of many wildlife species occur in those areas and may be impacted by the proposed action. The document should address these issues in a more clear and concise discussion.

Response: The EIS (draft and final) states, "The greatest impact to wildlife can be expected to occur as a result of clearing and construction operations in previously natural habitat." Increased hunting pressures are not mentioned as causing the most severe loss of wildlife populations, only as an additional impact. The final EIS has been revised to state that rights-of-way in farmland and other previously disturbed areas would have a "lesser" impact than in natural habitat. See section IV.A.2.b.

Comment: Losses to small animal populations within the right-of-way may be more than temporary. If suitable habitat is not available, the species in question will not reestablish to former levels.

Response: BPA agrees that affects to small animal populations may be more than temporary. The EIS states that clearing of rights-of-way and access roads may potentially affect local population levels of some species permanently. See section IV.A.2.b.

Comment: Bird mortalities resulting from power line collisions have been well documented. We do not consider this loss potential as insignificant especially when large concentrations (such as migrating waterfowl) are prevalent near power lines. Admittedly, illegal shootings are a serious problem but the cumulative effect of collisions may be a more serious problem. We believe your discussion should be oriented in this fashion.

Response: The EIS states, "Transmission lines have not been proven to be a general hazard to bird movements and there is no evidence to indicate that bird mortality due to collisions with BPA facilities is a significant problem." The EIS further states, "Although transmission lines have not been shown to generally represent a biological problem for birds, the potential for such a problem may exist in certain situations (emphasis added)." Our discussion of potential impacts to birds is not oriented to illegal shooting. See section IV.A.2.b.(2)(c).

Comment: The discussion on possible increased growth and development as a result of a new or expanded power source and subsequent

increased environmental impacts is well noted. Specific areas where this may occur as a result of the proposed actions should be identified.

Response: The study areas are shown on figure 3 in section II.

Comment: The extremely hazardous effects of PCB to fish and wildlife are well documented, and the potential for accidental contamination exists. We believe it would be far safer for non-PCB transformers to be used in the proposed construction in lieu of the gradual phase-out as planned.

Response: Bonneville Power Administration is fully cognizant of the environmental and health hazards of PCB. PCB is extensively regulated. The Toxic Substances Control Act prohibits the manufacture, distribution in commerce, or use of any PCB in a manner other than in a totally closed manner after January 1, 1978 [15 U.S.C. section 2605(e)(2)(A)]. EPA, in its final rulemaking on manufacturing, distribution in commerce, and use of PCB and PCB items, has determined that distribution and use of intact, non-leaking PCB transformers, as well as distribution in commerce and use of intact, non-leaking PCB capacitors, are considered to be totally enclosed (40 CFR 761.30). BPA's continued use of PCB transformers and PCB capacitors is, therefore, a permitted use.

BPA has only a very few PCB transformers and it is highly unlikely that the agency would be procuring and installing any additional PCB transformers. BPA does have a substantial inventory of PCB capacitors, however. As PCB capacitors (and transformers) fail, they are retired from service. EPA's regulations with respect to marking, containment, storage, transportation, and disposal, are fully adhered to. PCB capacitors in inventory are used as replacements for failed capacitors, or for installing additional capacitance at existing facilities. Normally this will only occur at substations where PCB capacitors are already present. PCB capacitors would be introduced into a substation where they have never been present only as a last resort. In such situations, the installation would be designed and the facility operated in such a manner that any chance of environmental contamination would be minimized. See section IV.B.1.

Comment: The (EIS) states that reliability criteria are the principal restrictions limiting the implementation of paralleling, due to the possibility of natural calamity and sabotage. Because of the value of paralleling as a mitigation measure, we feel this subject should be expanded in the final statement. Data should be included indicating the degree to which natural calamities and sabotage are an actual problem. Preventive measures and the degree to which the above factors influence decisionmaking should be discussed. Benefits to surveillance of single versus multiple corridors should be considered in the FES.

Response: Partly by considering the potential for natural calamities and sabotage in the past, the system has been designed to

avoid regional disruption or load area separation in the event of their occurrence. Therefore, this is not an actual problem. For example, the bombing of eleven BPA towers in 1974 (the J. Hawker incident) did not cause disruption because of system reliability. Since 1974, the cost of vandalism on the BPA system has averaged approximately \$250,000 per year. The EIS has been revised to state that reliability criteria is "another" restriction rather than the "principal" restriction; see section IV.A.

Comment: The Elmo substation will be scheduled for herbicide weed control. Also, on page A-21, the Kalispell-Kerr and Hot Springs-Anaconda power line rights-of-way passing through Lake County will be scheduled for vegetation control. The planned treatment is hand cutting followed by herbicide application to control stump sprouting. The Confederated Salish and Kootenai Tribal Council has not approved the use of herbicides for vegetation control. They should be consulted prior to the use of herbicides in the management of power line rights-of-way across tribal land.

Response: Included in the proposed program is provision for coordination of herbicide application on Indian reservations with the appropriate Indian tribe. See section II.B.5.

D. OREGON STATE DEPARTMENT OF FORESTRY, JANUARY 25, 1980

Comment: The Oregon State Department of Forestry strongly recommends that the BPA take a closer look at alternative proposals which will not remove forest land from timber production.

Response: The acreage noted in the EIS as being removed from timber production is only a rough estimate based on preliminary planning data. BPA will more closely examine alternatives in site specific environmental statements and analyses, including comparisons of the amounts of forest land that would be removed from timber production and the economic impacts of converting that land.

E. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, PUBLIC HEALTH SERVICE, JANUARY 23, 1980 AND FEBRUARY 22, 1980

Comment: In general, we have no major concerns regarding the proposal. We do, however, have some concern about the lack of discussion in the EIS regarding the possible health effects from electrostatic and electromagnetic fields. No summary of the research that has been done on the potential short-term and long-term effects from electric and magnetic fields of the type found under and around the proposed transmission lines could be found in the EIS.

Response: BPA has operated 500-kV transmission lines since the early 1960's. No adverse health effects to animals or people due to the electric fields of these lines have been reported. This is based on

operating experience and results of biological research conducted for BPA since 1974. Current research on the subject is presented in the BPA publication Electrical and Biological Effects of Transmission Lines: A Review. This publication describes the electrical effects of transmission lines and some of the methods used by BPA to reduce or eliminate undesirable biological effect. Copies are available upon request. See section IV.A.1.h.(2).

Comment: We believe that open burning of slash should be discouraged. Alternative methods of disposal should be pursued. The use of special harvest equipment may help prevent the need for excessive movement of chippers and road development. The chipped debris and other mulching material can, if properly scattered, provide a protective cover until vegetation stabilizes the soil from erosion. Slash disposal by windrowing in the rights-of-way should also be considered.

Response: Because of the cost of alternative methods of disposal and environmental trade-offs, natural draft open burning remains the primary disposal method and would be used where local air pollution regulations permit. However, where conditions preclude open burning, alternative methods such as chipping are utilized. In some cases, small piles of slash are left as wildlife cover. This is limited because of fire hazard, insect infestation, or where the land owner disapproves. See section IV.A.2.a.(1).

Comment: Alternatives to herbicides control should be considered in controlling vegetative growth in transmission rights-of-way. Conversion of previously timbered areas or other non-use areas to public or private grazing lands with incentives to promote its use would eliminate the need for herbicide control and provide some public benefits. We believe that the use of herbicides in controlling vegetation by broadcasting or aerial spraying should be restricted only to those areas that are not accessible by surface vehicles and where hand or mechanical clearing is not possible. Additional information should also be provided on the potential human health effects from the herbicides which will be used most frequently.

Response: BPA encourages the multiple use of its rights-of-way. Any beneficial use of the land that does not conflict with maintaining a safe and reliable transmission system is acceptable. The particular use, such as grazing, is determined by the land owner. Of the right-of-way acreage proposed for vegetation control in FY 1981, only 20 percent would involve aerial application of herbicides. See section II.B.5. for a discussion of where aerial application would be the preferred method. The EIS has been revised to include a summary of the research on the potential human health effects of the herbicides proposed for BPA use. See section IV.B.2.b.

Comment: We recognize that PCB is utilized in some of BPA's transformers, capacitors, and storage containers. According to the EIS, all PCB components, as they fail, will be replaced with non-PCB components. It is also important that any new installations not use any PCB components.

Response: See the previous response to a similar comment by the Department of Interior.

Comment: In discussing biological effects of electric fields in the EIS, consideration should be given to minimizing any potential occupational hazards from the transmission lines in farm fields or orchards where large farm equipment and transport vehicles might be used. It would also be helpful to describe in the EIS the existence and nature of specific use restrictions within the transmission corridor and any special ground clearances of transmission lines (where ground activity is considerable and potentially incompatible) to minimize public health hazards.

Response: As stated in the draft EIS, farm operators must observe basic precautions when working underneath transmission lines. Also, certain large gun-type irrigation systems should not be used where an unbroken stream of water could come near a conductor. BPA grounds all stationary metallic objects which could otherwise produce involuntary muscle reaction if contacted. The electromagnetic effects are most significant with objects which parallel the transmission lines. See sections IV.A.2.h.(1) and (2).

As stated earlier, land uses that do not conflict with maintaining a safe and reliable transmission system are acceptable. Timber production and large buildings are generally not compatible, and kite flying under electrical wires can be hazardous. Where crossing highways and roads, the height of transmission lines is raised to reduce the electric field strengths at ground level. See section II.B.5.

F. WASHINGTON STATE DEPARTMENT OF ECOLOGY, JANUARY 25, 1980

Comment: The draft EIS contains limited information on road construction and maintenance. The final EIS should contain specific information on the methods of road construction, road maintenance, and erosion control to determine whether minimum water quality protection goals will be met. This should include a description of methods to prevent damage to fish resources and domestic water supplies caused by fording small streams. Also, there should be a description of the type of road drainage facilities which will be used to prevent erosion.

Response: Permanent access roads are built to an improved condition which includes a drainage system (culverts, water bars, etc.), grading and spreading of crushed aggregate, and seeding of cut and filled slopes. Protection of fish resources is discussed in section IV.A.2.b.(2)(a).

Comment: The EIS indicates the unauthorized use of roads is common and may result in additional erosion and stream siltation. Those roads that are not designed for all weather use should be blocked or gated to minimize the occurrence of unauthorized use.

Response: As stated in the EIS, BPA will cooperate with land-owners and land management agencies in preventing unauthorized use of access roads by installing gates and locks. See section IV.A.1.e.

Comment: The discussion of vegetation management with herbicides indicates there will not be spraying within 100 feet of streams, lakes, etc. Aerial spraying from above transmission facilities probably requires that aircraft fly at an elevation of 150 to 200 feet above ground. At that height, the likelihood of chemical drift is greatly increased, thus resulting in chemical application to non-target areas. Additional information on drift measures and alternatives to vegetation management with herbicides should be included in the final EIS.

Response: BPA standards prescribe an altitude of 160 feet above ground level as the maximum release height for herbicides. Additional information on drift control can be found in section IV.B.2.b.(2)(a).

Comment: The projects described in this program may require a shoreline substantial development permit if they meet the criteria in the enclosed regulations. If a permit is needed, the project must meet the requirements of the local government's shoreline master program.

Response: BPA, as an agency of the Federal Government, is not obliged to obtain siting permits from State or local governments. The supremacy clause of the United States Constitution prevents State and local control over the operations of the Federal Government unless specifically waived by Congress. Control includes the issuance of permits. Section 404(t) of the Clean Water Act allows any State or interstate agency to control the discharge of dredged or fill material in navigable waters within their jurisdiction, including activities of Federal agencies. Where BPA would discharge dredged or fill material into these waters and such activity is controlled by the State, BPA will comply both substantively and procedurally with the requirements of the State. Otherwise, BPA will not seek a permit under the State of Washington Shoreline Management Act. See section IV.A.2.c.(2)(e).

Apart from the issue of permits, BPA has an obligation under the Office of Management and Budget Circular A-95 (1) to provide information to and consult with State and local governments on the proposed projects and (2) to assure maximum feasible consistency of the proposed projects with State and local plans and programs. A decision to proceed with a BPA action incompatible with State and local development plans and programs shall be made only where there is clear justification. Explanation of any necessary inconsistency will be included in the appropriate site-specific environmental analysis. See section IV.A.1.

G. SKAMANIA REGIONAL PLANNING COUNCIL, JANUARY 24, 1980

Comment: The Council is concerned about the use of aerial spraying in Skamania County, particularly in the Columbia River Gorge

where strong wind conditions often exist. The current plan proposes the use of water and oil based herbicides that are applied by aerial or ground methods in Skamania County. It is hoped that every effort is made to use pelletized forms of herbicides rather than aerial sprays to minimize any environmental impact.

Response: Aerial application is restricted when wind velocity exceeds 6 mph. See section II.B.4. Pelleted herbicides would seldom be applied by air because of the high cost. More often, solid forms of herbicides are applied selectively by hand where the density of undesirable vegetation is relatively thin and there is little danger of the chemical being washed from the area.

H. OREGON ENVIRONMENTAL COUNCIL, JANUARY 30, 1980

Comment: During the 1960's and 1970's, the commonly-accepted prediction for electrical load growth was that it would "double every decade." The Draft EIS shows an increase of 3.7 percent per year. This is a doubling every two decades. It is possible that lower estimates may occur in the future.

Response: Future estimates of load growth may indeed be lower. In fact, the new estimated average annual load growth rate issued by the Pacific Northwest Utilities Conference Committee (PNUCC) this year is 3.1 percent over the next 20 years. See section I.A.1.

Comment: The alternative of conservation is not taken seriously in the Draft EIS. In the proposed Allocation Plan recently discussed at BPA, preference customers would be eligible to receive more power from BPA if serious conservation efforts were undertaken. The effect of this possible overall reduction should be noted in the EIS for the FY 1981 Program.

Response: The PNUCC has factored anticipated conservation into the forecast discussed above. Also, the transmission facilities included in the FY 1981 proposed program are planned and designed to meet a higher peak demand with less new generation. To some degree, then, conservation is factored into the BPA proposed construction program. The discussion of conservation in the EIS is directed mainly at conservation as an alternative to all construction. The main conclusion of this discussion is that conservation is not a feasible alternative to the proposed construction because such programs could not be implemented to reduce the projected load in time to obviate the need for new facility construction. See section II.A.4.

Similarly, a new allocation policy is not scheduled to be implemented until 1983, with any benefits from potential conservation being realized only gradually after that. Therefore, a new allocation policy would not affect the need for the proposed construction.

Comment: A part of the justification for new transmission lines in Western Washington and Oregon is the anticipation of continued large power flows from Canada to California. (SA 80-1, pg. 2) The EIS should reference load-growth predictions in Canada, to demonstrate the degree of credibility of this prediction.

Response: The Allston-Portland (SA-81-1) Draft Facility Planning Supplement attached to the draft EIS states, "The need for the proposed facilities is based on BPA load growth and location of generating plants within the BPA service area. Power flow from Canada through our system aggravates an already unsatisfactory situation (pg. 2)." Also, power flow from Canada does not directly involve many of the new and upgraded facilities included in the FY 1981 proposed construction program. Therefore, load growth in Canada is not a consideration in the purpose of and need for action in this programmatic EIS. See section I.A.1.

Comment: Overloading the system during periods of peak demands, with the consequent likelihood of uncontrolled power failures, is not a viable alternative. A possibility of alleviating this overload is through planned rotation of outages to specified loads or geographical areas. This suggestion, however, would be one of last resort.

Response: The EIS is revised to mention planned rotating outages under the nonconstruction alternative. See section II.A.3.

Comment: Another possibility for addressing the problem of overloads is "load management." BPA might consider the controlled restriction of certain loads at peak periods.

Load management technology is discussed as if it were yet to be developed. It is being used now, in some countries such as Germany. Implementation in the Northwest would require time for permissive regulations, engineering, and installation.

The lack of any load-management plan is cited as a reason for not considering it in the FY 1981 Program. Is there any "plan for a plan?" If not, this question may continue to be raised without the problem being addressed. BPA must begin to address the lack of a load-management plan.

Response: A major form of load management has been in effect in the Pacific Northwest for more than 25 years--BPA's sales of large blocks of interruptible power to its direct service industries. These sales have been effective in load management over the years and several regional utilities have begun serving loads on an interruptible basis.

The assessment of additional means of load management requires further detailed investigation in several areas including:

1. Types of loads that are most applicable to control at point of use.

2. Analysis of control methods of pricing alternatives as complements and substitutes.

3. Development of load management programs that would be politically, socially, and economically applicable to utility systems in the region.

4. Further cost/benefit analyses of alternative means of meeting the deficits.

BPA and the region's utilities are closely following load management research being done in other parts of the Nation. However, BPA sells power only for resale and to the large industries discussed above. Since load management devices are necessarily installed on the ultimate consumers' facilities, further regional load management must be implemented on the systems of the more than 120 non-Federal agencies which serve the ultimate consumer. When and if load management proves generally beneficial and cost-effective, we believe it will be implemented to offset a part of the region's peaking needs. It is most improbable that load management will be achieved in the next 5 to 10 years in amounts sufficient to offset the need for the proposed FY 1981 construction program, to which the discussion in section II.A.4. is directed.

Comment: Use of these poisons (herbicides) might in fact be avoided if other ways to remove brush were found to be feasible. A recent study by Jan M. Newton, Ph.D., shows that manual brushing may in fact be economically feasible. This section should perhaps be updated to include the most recent opinion and facts available.

Response: We have reviewed Dr. Newton's study and found that it compares only aerial herbicide application with mechanical control. The BPA proposed vegetation management program includes other herbicide application methods that are far more selective than aerial application. Also, her study is oriented toward the forest industry which has entirely different goals for vegetation management than BPA. The analysis of herbicide effects in section IV.B.2.b. has been considerably revised to include many references.

Comment: The discussions on pages 49 and 50 (of the draft EIS) explain that the herbicides used by BPA have low toxicity to animals. It is noted that such herbicides are "readily excreted." Information should be provided here to document the lack of effects on animals.

Response: The EIS has been revised to include this information. See section IV.B.2.b.(3).

Comment: "BPA will not convert prime or unique farmlands to other uses unless other national interests override the importance of preservation. . . ." We would ask here what is the national interest(s); how is it determined and by who? Are essential uses of electricity delineated, as opposed to trivial or wasteful uses, in such a determination? The EIS should give some answers to these questions.

Response: The national interest of concern to BPA is fulfillment of its responsibilities to provide the power marketing and transmission services as mandated by the Bonneville Project Act. The BPA Administrator is responsible for such decisions which are based on staff analyses and national policy. BPA sells power only for resale and to its direct service industries, and is not in a position to discriminate between ultimate end-uses. See section I.

I. COWLITZ COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT, JANUARY 29, 1980

Comment: The Allston-Portland Area Reinforcement Study described in the above referenced document proposed three river crossings in Cowlitz County in Plan A. The Columbia, Kalama, and Lewis Rivers fall within the jurisdiction of the Shoreline Management Act of 1971, thereby necessitating substantial development permits from Cowlitz County for these crossings.

Comment: As you point out, Plan A would cross the Columbia River floodplain north of Kalama. Any activity taking place within the 100-year floodplain will require a Floodplain Management Permit. Structures must be firmly anchored or affixed to the reality in order to prevent dislocation by floodwater and damage to life, health and property.

Response: Please see the response to a similar comment made by the Washington State Department of Ecology. Also, please see section IV.A.2.c.(2)(a) for BPA's policy regarding actions in 100-year floodplains.

Comment: Does exposure to these types of electric and magnetic fields create stress, generate resistance breakdowns, contribute to hypertension, heart attacks, headaches, drowsiness, nervous exhaustion, blood disorders, and cancer in humans?

Response: Please see the previous response to the Department of Health, Education, and Welfare comment concerning the health effects of electric fields.

Comment: Likewise, what is the impact on plants and animals in the agricultural section? Even though BPA is not aware of any conclusive evidence or research findings indicating that exposure to electrostatic and electromagnetic fields near operating transmission lines results in any harmful effects to humans, animals, and plants, what hypothesis or possibilities are known?

Response: At the field strengths under BPA transmission lines, there are no known effects to plants or animals. Many hypotheses exist regarding the possible effects of electrostatic and electromagnetic fields. These hypotheses are discussed in the BPA publication Electrical and Biological Effects of Transmission Lines: A Review which is available upon request. Hypotheses include: possible effects on

honey production by honeybees, decreases in the immunity system, increased prostate infection, increased excitability of nerve functions, decreased growth, increased mortality, and changes in serum proteins and corticoids.

Public and scientific interest in the possible effects of transmission lines, especially those of electric fields, continues to run high. We believe, however, the information developed indicates the low probability that the fields produced by BPA transmission lines pose any hazard to animals or people. This finding is also consistent with conclusions reached by the majority of other reviews we have seen of biologic effects of transmission line electric fields. See section IV.A.1.h.(2).

J. OREGON DEPARTMENT OF LANDS, JANUARY 30, 1980

Comment: The application of herbicides will have minimal effect on evergreen species. The statement. . .that all woody vegetation species would be defoliated is a misnomer.

Response: In past years, BPA has successfully controlled many evergreen species with herbicides. Most, rather than all, woody species would be defoliated on land treated by aerial application of herbicides. See section II.B.4.

Comment: We recommend hand removal of vegetation particularly within 200 feet of any designated aquatic buffer zone.

Response: Through herbicide residue monitoring, BPA has found 100 feet to be an adequate buffer zone for aerial application, and 10 feet for selective ground application. See section IV.B.2.b.(3). Hand and mechanical cutting is proposed for 1,735 acres or 9.3 percent of the FY 1981 vegetation management program. Some herbicides are approved by the EPA for use to water's edge. See sections II.B.4. and 5.

K. U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE, JANUARY 30, 1980

Comment: There should be a provision in the EIS for further coordination with the Forest Service and other agencies on a more site-specific basis.

Response: On a site-specific basis, BPA will consult with agencies that have special expertise or jurisdiction by law. Land management agencies such as the Forest Service, and resource protection agencies such as the Heritage Conservation and Recreation Service, will be consulted when they may be interested in or affected by a proposed action. See section II.B.5.

Comment: The EIS needs to incorporate the new Forest Service Manual herbicide amendment [FSM 2100, Amendment No. 10, (10/79) (copy

enclosed)] in the proposal. It will be necessary for BPA to submit a request for any proposed use of herbicides on National Forest System land. This request should be accompanied by an environmental assessment (Forest Service Manual 1950, enclosed) prepared by BPA and sent to the responsible Forest Service official. These documents should be sent to the Forest Service headquarters office responsible for administration of the National Forest lands involved.

Response: BPA's rights-of-way located on U.S. Forest Service land have been maintained under mutually acceptable right-of-way management plans. The proposed FY 1981 maintenance and right-of-way management program is in accordance with those management plans. BPA views this program as a single major Federal action significantly affecting the quality of the human environment. The impacts of the individual actions are, in many cases, cumulative. Also, many of these actions are similar in timing, impacts, alternatives, and methods of implementation. Therefore, we have prepared this programmatic EIS to generically evaluate the individual actions of the proposed maintenance and right-of-way management program. See the Council on Environmental Quality Regulations at 40 CFR Part 1502.4(c). We believe that the FY 1981 EIS adequately describes the impacts of the proposed use of herbicides. This programmatic EIS, together with the right-of-way management plans and BPA's Right-of-Way Management Standard (No. 63040-50), provides the Forest Service with the information it requires under the Forest Service Manual 1950.

Comment: We feel that BPA has properly displayed and analyzed use of herbicides in the treatment of foliage; however, we feel they did not adequately handle the prevalent public controversy concerning use of herbicides.

Response: In the final EIS we have substantially expanded the discussion of herbicide use. See section IV.B.2.b.

Comment: It is mentioned several times that spraying (aerially) will be no closer than 100 feet to streams or bodies of water. We suggest some qualifier might be added to that such as; "or as otherwise agreed with land manager or owner."

Response: As provided in the maintenance and right-of-way management proposal, if a landowner objects to BPA vegetation management methods he or she may assume responsibility for the vegetation on the right-of-way. See section II.B.5.

Comment: Maintenance of rights-of-way for transmission lines and access roads should be covered in the EIS. It would be easier to follow proposed maintenance work if the EIS referenced the BPA-FS Right-of-Way Management Plan for each line and Forest.

Response: Maintenance of rights-of-way for transmission lines and access roads is covered in the EIS.

Existing right-of-way management plans are identified by BPA's transmission line or corridor name and the Forest Service Forest and Ranger District. The proposed vegetation management program is similarly identified in Table 5.

L. U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE, REGION 4,
JANUARY 31, 1980

Comment: Prior to any further planning for hand cutting or herbicide treatment with Tordon 101, your maintenance supervisor at Idaho Falls should contact the Forest Supervisor, Targhee National Forest, at St. Anthony, Idaho.

Response: As provided in the proposed maintenance and right-of-way management program, BPA would coordinate herbicide application on public lands with the appropriate land management agency. See section II.B.5.

M. U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE, FLATHEAD
NATIONAL FOREST, FEBRUARY 6, 1980

Comment: We have routed your Draft EIS for FY 1981 to our staff specialists for review. Their overwhelming comment was the apparent lack of energy "conservation" as a major BPA thrust in FY 1981. Instead, the emphasis appears to be business as usual, with maintenance and construction projects based on continued increased energy demands. BPA needs to take steps to encourage--perhaps demand--conservation. The environmental and political consequences of failing to do this becomes more apparent each day. BPA should provide national leadership in energy conservation.

Response: Please see the previous response to the Oregon Environmental Council comment concerning conservation. In addition, BPA is encouraging energy conservation in several ways. In November 1979, the Administration and the Congress approved a BPA proposal to undertake four pilot energy conservation projects costing from \$4.3 to \$7.0 million over the next 2 years. These pilot programs, to be administered in cooperation with 30 public utilities and cooperatives in Idaho, Oregon, Washington, and western Montana, are summarized as follows:

1. A home weatherization project involving some 2500 residences will include consumer information and assistance, home energy audits, and interest-free loans for cost-effective weatherization.

2. A residential solar water heat program will involve selection of several utilities representing climatic and geographic diversity within the region. BPA will partially finance, through the utilities, solar water heaters in 400 to 600 homes and provide low-interest loans to cover the remaining cost.

3. An irrigation pump testing pilot project was started in 1979 and will be continued and expanded. The program provides irrigation pump testing services to farmers working through local public utilities. There are more than 20,000 irrigation customers in the region consuming over 2 billion kilowatthours of electricity annually. Pump testing will help assure that this group of consumers use the most efficient practices.

4. Twelve small windmills will be constructed to test the feasibility and effectiveness of such units on homes and farms in Klickitat County, Washington. The project will help to determine the extent to which wind power can displace the need for electricity supplied by utilities, as well as the efficacy of feeding back surplus wind-generated electricity into the power grid for other local utility needs.

During the "pilot" phase of these programs, a number of factors will be evaluated including potential energy savings in the region, costs and performance of hardware, and administrative aspects of implementing the programs. On the basis of the evaluation, the programs may be modified and expanded regionwide. The regional legislation now before Congress would greatly expand BPA's present limited authority to invest in energy conservation and the development of renewable energy resources.

Please see section II.A.4. for an additional discussion of conservation programs.

Comment: The DEIS refers to BPA standards governing use and application of herbicides. You need to insure that your herbicide standards conform to U.S. Department of Agriculture and EPA standards.

Response: BPA's herbicide use standards have been prepared in strict conformance with EPA standards and should, therefore, be compatible with USDA basic policies. The right-of-way management plans for BPA rights-of-way on Forest Service land may include more stringent standards.

Comment: The herbicide reference cited on the bottom of page 25 is 10 years old. There is a considerable amount of more current literature.

Response: The final EIS has been revised to include many more references, some of which are more current. See section VIII.

Comment: Your proposal to continue disposing of slash through burning needs to be re-examined. This type of deliberate reduction in air quality, coupled with a waste of BTU's, needs to be changed in the near future. Changes probably cannot be implemented in FY 1981, but BPA needs to begin seeking alternative means of slash utilization.

Response: Alternative methods for disposal of slash are discussed in section IV.A.2.a.(1). BPA and the U.S. Forest Service are jointly preparing a study for a 25 MW biomass woodfired generating plant utilizing forest logging residue as a fuel. Also, BPA is a cosponsor in a feasibility study of wood residue fired cogeneration at Heppner, Oregon. See section II.A.7.b. for a discussion of BPA involvement in projects investigating the use of wood residue as fuel.

N. REGIONAL PLANNING COUNCIL OF CLARK COUNTY, FEBRUARY 8, 1980

Comment: Herbicide residue monitoring information is not presented for Tordon 101, which is proposed for use on the North Bonneville-Ross No. 1 transmission line in Clark County. Is such data available? Why is such data presented for 2,4-D, Dicamba, and Picloram as a potassium salt, and not for Picloram as the trichloropropanolamine salt?

Response: Tordon 101 contains 1 part Picloram and 4 parts 2,4-D so the data for 2,4-D and Picloram applies to Tordon 101. Whether formulated as the potassium salt or the trichloropropanolamine salt, Picloram is prepared from 4-amino-3,5,6-trichloropicolinic acid. When mixed with water, the salt dissolves releasing the acid which produces the herbicidal activity. Because both salts have similar solubility, monitoring data for Picloram as the potassium salt should also indicate what fate to expect for Picloram as the trichloropropanolamine salt. See section IV.B.2.b.(3)(c).

Comment: The EIS notes that high-voltage power lines produce ozone. The southern part of Clark County is designated an ozone non-attainment area by EPA. Any production of ozone would adversely impact local efforts to attain National Ambient Air Quality Standards.

Response: Ozone produced by corona on transmission lines is difficult to measure under field conditions because of the small amounts produced, rapid dispersal, and ambient levels that vary widely. Most studies have concluded that transmission lines contribute insignificant amounts of ozone to local levels.

Comment: Stream crossings in the County may require substantial development permits, in accordance with the County's Shoreline Master Program.

Response: Please see the previous response to a similar comment by the Washington State Department of Ecology.

O. DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS, FEBRUARY 8, 1980

Comment: We feel that a comment on the proposed (1989) southwest intertie is appropriate (referenced in your Draft EIS Figure 1--BPA Main Grid Additions, and page 4--Draft Facility Planning Supplements).

Although the intertie is not directly addressed as part of the FY 1981 program, it is being considered in the planning and development of those facilities that are in the program. The utility of the intertie will be impacted by thermal energy resources whose schedules continue to slip. We believe that no facilities, whether they be the intertie or FY 1981 program, should be planned on the basis that the Federal hydroelectric projects will make up the projected thermal deficiencies.

Response: You are correct in asserting that "the utility of the intertie will be impacted by thermal energy resources whose schedules continue to slip." Recent studies show that construction of the second d.c. line does not at this time provide sufficient power benefits nor have environmental studies been completed. However, BPA will be reevaluating the feasibility of this line as changes in the power situation in the PNW and PSW occur. Therefore, our projected 10-year construction program will continue to include plans for a second d.c. line at least until such time as a final decision is made in the mid-1980's. For a discussion of the purpose of and need for the proposed construction program see section I.A.

We also agree that the Federal Columbia River Power System cannot be counted on to make up for continuing delays in completion of thermal plants needed for carrying loads. Implicit in our proposed allocation policy is that current planning and operation of the Federal system will proceed in the contractually specified manner. Changes in operating criteria that might be proposed would have to be reviewed, as General Wells states in his December 21 letter to Sterling Munro, "in a forum. . . larger than the electrical utility industry."

SUMMARIES OF PUBLIC MEETINGS

XI. SUMMARIES OF PUBLIC MEETINGS

Public meetings were held in Vancouver, Washington and Rainier, Oregon to discuss the draft EIS for the Proposed Fiscal Year 1981 Program and Allston-Portland Area Service Draft Facility Planning Supplement. A court reporter was present at both meetings to record questions and statements by the public. At each meeting the public generally focused their interest on the Allston-Portland Supplement.

A. VANCOUVER, WASHINGTON - JANUARY 16, 1980

Ten members of the public attended the meeting. One statement suggested that new transmission facilities benefit only the aluminum industry and that the Allston-Portland line should not be built in Clark County because no benefits would be realized there. Concern was expressed regarding trespassing on rights-of-way, helicopter maintenance patrols, aerial application of herbicides, electrical and biological effects, impacts to the Clackamas River, and noxious weed control. Suggested alternatives to the Allston-Portland proposal included reconductoring, undergrounding, and no build.

B. RAINIER, OREGON - JANUARY 17, 1980

Forty-seven members of the public and one news reporter attended the meeting. General comments expressed concern that the comment period was too brief, that local agencies were not notified or sent a copy of the draft EIS, and questioned long-range planning. Objections were raised about the method of compensation for easements and timber, the sacrifice of timberland in favor of esthetic protection, and the lack of noxious weed control.

Comments directed specifically at the Allston-Portland Supplement expressed a desire for more public meetings, concern over misinformation and a lack of more specific information, concern over potential conflicts with a park and a school grounds, and a feeling that Columbia County would not benefit so the transmission line should be built on the industrial side of the Columbia River rather than in Columbia County. Suggested alternatives included undergrounding and rebuilding on existing rights-of-way. Many felt certain that BPA had already determined the transmission line location.



APPENDIX 1: SUPPLEMENTARY 2,4-D LABORATORY TOXICITY DATA

APPENDIX 1
SUPPLEMENTARY 2,4-D LABORATORY TOXICITY DATA

ACUTE ORAL TOXICITY OF 2,4-D TO LABORATORY AND DOMESTIC ANIMALS AND BIRDS

Sources: National Research Council of Canada,
Phenoxy Herbicides: Their Effects on Environmental Quality, 1978.
U. S. Forest Service, Region 6, Vegetation Management with Herbicides
(Environmental Impact Statement), 1974.

Formulation	Species	Age or Sex	LD50 mg/kg-body weight		Reference
Acid	Mouse	M	368		Rowe and Hymas 1954
	Rat	M	375		" " " "
	Rat	?	500		McLaughlin 1951
	Guinea pig	?	320		" "
	Guinea pig	Mixed	469		Rowe and Hymas 1954
	Dog	Mixed	100		Drill and Hiratzka 1953
	Chicks	Mixed	541		Rowe and Hymas 1954
	Pheasant	?	472		Tucker and Crabtree 1970
Alkanolamine	Chicks	Mixed	380,	765	Bjorn and Northen 1948
"			380,	765	Rowe et al. 1954
Amino salt	Chicken	F	1950		Loktionov et al. 1973
	Rat	?	1200		" " " "
	Mouse	?	300		" " " "
Butoxy ethyl ester Butyl esters	Chicks	Mixed	900		Whitehead and Pettigrew 1972a
	Mouse	F	713		Rowe and Hymas 1954
	Rat	F	620		" " " "
	"	?	620		Edson et al. 1964
	Guinea Pig	F	848		" " " "
	Rabbit	F	424		" " " "
	Cattle	Mixed	100		Björklund and Erne 1966
	Pig	Mixed	100		" " " "
	Chicks	Mixed	2000		Rowe and Hymas 1954
	Bull finch	Adult	1340 (in water)		Stupnikov 1972
			450 (in mineral oil)		

APPENDIX 1
SUPPLEMENTARY 2,4-D LABORATORY TOXICITY DATA

Acute oral toxicity of 2,4-D to laboratory and domestic animals and birds (cont'd)

Formulation	Species	Age or Sex	LD50 mg/kg-body weight	Reference
	Sparrow	Adult	1250 (in water)	" "
	Mountain finch	Adult	1350	" "
	Rat	?	920-1500 (in water)	" "
			300- 400 (in diesel)	" "
	Mouse	?	380- 640 (in water)	" "
Isopropyl ester	Mouse	M	541	Rowe and Hymas 1954
	Rat	Mixed	700	" " " "
	"	-	700	Hayes 1964
	Guinea pig	M	550	Rowe and Hymas 1954
	Chicks	Mixed	1420	" " " "
K-Na salt	Cattle (2)	Mixed	100	Björklund and Erne 1966
	Rat	M	100	" " " "
Na salt	Mouse	?	375	Hill and Carlisle 1947
	Mouse	?	360	Loktionov et al. 1973
	Rat	F	805	Rowe and Hymas 1954
	Rat	?	666	Hill and Carlisle 1947
	Guinea pig	M	551	Rowe and Hymas 1954
	Guinea pig	?	1000	Hill and Carlisle 1947
	Rabbit	?	800	" " " "
	Chicken	F	655	Loktionov et al. 1973
	Monkey	?	214	Hill and Carlisle 1947
	Rat	?	730	Loktionov et al. 1973
PGBE esters	Rat	F	570	Rowe and Hymas 1954
Triethanolamine	Chicken	Mixed	200	Erne 1966b
	Chicken	Mixed	300	Björklund and Erne 1966
	Cattle	Mixed	200	" " " "
	Pig	Mixed	100	" " " "
	Pig	?	500 (Lethal Dose)	" " " "

ACUTE TOXICITY OF 2,4-D TO AQUATIC INHABITANTS

Source: U.S. Forest Service, Region 6, Methods of Managing Competing Vegetation (Draft Environmental Impact Statement), 1980.

<u>Formulation</u>	<u>Organism</u>	<u>Dose</u>	<u>Effect</u>	<u>Reference</u>
Butoxyethanol ester	Oyster	3.75 ppm (96 hrs)	50% decrease in shell growth	Butler (1965)
" "	Shrimp	1 ppm (48 hrs)	No effect	Butler (1965)
	Fish (Salt water)	5 ppm	48 hr TLM	Butler (1965)
	Phytoplankton	1 ppm	16% decrease in CO ₂ /fixation	Butler (1965)
Dimethylamine	Oyster	2 ppm (96 hrs)	No effect on shell growth	Butler (1965)
"	Shrimp	2 ppm (48 hrs)	10% mortality or paralysis	Butler (1965)
	Fish (salt water)	15 ppm (48 hrs)	No effect	Butler (1965)
	Phytoplankton	1 ppm (4 hrs)	No effect on CO ₂ fixation	Butler (1965)
Ethylhexyl ester	Oyster	5 ppm (96 hrs)	38% decrease in shell growth	Butler (1965)
" "	Shrimp	2 ppm (48 hrs)	10% mortality or paralysis	Butler (1965)
" "	Fish (salt water)	10 ppm (48 hrs)	No effect	Butler (1965)
" "	Phytoplankton	1 ppm (4 hrs)	49% decrease in CO ₂ fixation	Butler (1965)
PGBE ester	Oyster	1 ppm (96 hrs)	39% decrease in shell growth	Butler (1965)
" "	Shrimp	1 ppm (48 hrs)	No effect	Butler (1965)
" "	Fish (salt water)	4.5 ppm	48 hr TLM	Butler (1965)
" "	Phytoplankton	1 ppm (4 hrs)	44% decrease in CO ₂ fixation	Butler (1965)
Dimethylamine	Bluegill	166 ppm	48 hr TLM	Lawrence (1966)
Alkanolamine	Bluegill	435 ppm	48 hr TLM	Lawrence (1966)
Isooctyl ester	Bluegill	9 ppm	48 hr TLM	Lawrence (1966)
Butyl ester	Bluegill	1 ppm	48 hr TLM	Lawrence (1966)
Isopropyl ester	Bluegill	1 ppm	48 hr TLM	Lawrence (1966)
PGBE	Bluegill	3 ppm	48 hr TLM	Hughs & Davis (1966)

ACUTE TOXICITY OF 2,4-D TO BLUEGILL FISH

Source: National Research Council of Canada,
Herbicides: Their Effects on Environmental Quality, 1978

Formulation	Exposure Time (hours)	LC50 (mg/l)(a)	Reference
Dimethylamine	24	350-390	Davis and Hardcastle 1959
	48	375	" " " "
Alkanolamine, ethanol and isopropanol series (three batches)	24	450-900	Hughes and Davis 1963
	48	435-840	" " " "
Dimethylamine (six batches)	24	166-542	" " " "
	48	166-458	" " " "
Di-N-N-dimethylcocoamine	24	1.5	" " " "
	48	1.5	" " " "
Acid and emulsifiers	24	8	" " " "
	48	8	" " " "
Isooctyl ester (three batches)	24	8.8-66.3	" " " "
	48	8.8-59.7	" " " "
PGBE ester(c)	24	2.1	
	48	2.1	
Butoxyethanol ester	24	2.1	" " " "
	48	2.1	" " " "
Butyl ester	24	1.3	" " " "
	48	1.3	" " " "
Mixed butyl, isopropyl ester (two batches)	24	1.6-1-7	" " " "
	48	1.5-1-7	" " " "
Isopropyl ester	24	0.9	" " " "
	48	0.8	" " " "
Ethyl ester	24	1.4	" " " "
	48	1.4	" " " "
Butoxyethanol ester	24	1.5-1.7(b)	Inglis and Davis 1972
	48	1.4-1-5(b)	" " " "
PGBE ester	24	1.0-1.2(b)	" " " "

Acute Toxicity of 2,4-D to Bluegill Fish (cont'd)

Formulation	Exposure Time (hours)	LC50 (mg/l)(a)	Reference
PGBE ester	24	3.3 ^(b)	Cope et al. 1970
Oleic-1,3-propylene diamine	24 48	4.0 3.6	Davis and Hughes 1963 " " " "
Butyl ester	24 48	10.0	" " " "
Butyl ester, oil soluable formulation	24 48	4.9 3.7	" " " "

a LC50 values are in terms of acid equivalent, unless marked with b.

b Acid equivalency not given or not clear from reference.

c Propylene glycol butyl ether ester.

SS00-00660

ACUTE TOXICITY OF 2,4-D TO FISH OTHER THAN BLUEGILLS

Source: National Research Council of Canada,
Herbicides: Their Effects on Environmental Quality, 1978.

Formulation	Fish	Exposure Time (hours)	LC50 (mg/l)(a)	Reference
Acid	Perch	48	75	Bandt 1957
	Roach	48	75	
Dimethylamine	Large mouth bass	24	350-375	Davis and Hardcastle 1959
		48	350	
Ethylhexyl ester	Lake emerald shiner	24	280-620	Swabey and Schenk 1963
PGBE ester(c)	Longnose killi-fish	48	4.5(b)	Butler 1965
PGBE ester(c)	Rainbow trout	48	1.1	Bohmont 1967
Butoxyethyl ester	Harlequin fish	24	1.0(b)	Alabaster 1969
		48		
Sodium salt	"	24	1160(b)	" "
Triethanol amine	"	24	125	" "
		48	105	
Acid, salts	Green sunfish	41	110	Sergeant et al. 1971
Butyl ester	Bluegill	96	1.8(b)	Walker 1964
PGBE ester(c)	Redear sunfish	96	3.1(b)	" "
BEE ester	Green sunfish	96	3.7(b)	" "
Sodium salt	Largemouth bass	96	66.(b)	" "
			160(b)	
Isooctyl ester				" "
Butoxyethanol ester	Black bullhead	24	8.7-8.8(b,d)	Inglis and Davis 1972
	Goldfish	24	3.6-4.1(b,d)	
	Rainbow trout	24	1.5-1.6(b,d)	

a. LC50 values are in terms of acid equivalent, unless marked with b.

b. Acid equivalency not given or not clear from reference.

c. Propylene glycol butyl ether ester.

d. Ranges due to use of water of different hardnesses.

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING

Formulation	Species (Number of test animals per group)	Sex	Dosage regime	Each dose mg/kg-body weight	Effects	References
Acid	Rat (5-6)	F	5 doses/wk, 4 wks	3, 10, 30 100 300	No adverse effects Depressed growth rate; gastro-intestinal swelling Mortality 5/5	Rowe and Hymas 1954
	Dog (2-4)	Mixed	5 doses/wk, 13 wks	2, 5, 10 20	No mortalities Mortality 3/4	Drill and Hiratzka 1953
	Mule deer		30 days	80, 240	Minor symptoms	Tucker and Crabtree 1970
Alkanolamine	White rock chicks (5)	Mixed	3 doses/wk, 4 wks	0.28, 2.8, 28 280	No effect on weight gain Slightly depressed weight gain	Bjorn and Northern 1948
	Sheep (1)	?	daily, 481 days	100	No effect	Palmer and Radeleff
	Sheep (1)		daily, 7 days	500	Mortality 1/1	1964
	Cattle (1)	?	5 doses/wk, 22 wks	50	No effect	
	"	?	"	100	Chronic tympanites	
	"		"	200	Mortality 1/1	
	"		daily, 20 days	250	Mortality 1/1	
PGBE esters	Sheep (1)	?	daily, 481 days	100	No effect	Palmer and Radeleff 1964
	Sheep (1)	?	daily, 9 days	200	Mortality 1/1	" " " "
	Cattle		daily, 10 days	100	No effect	" " " "
	Cattle (1)	?	daily, 10 days	250	Weight loss, anorexia	" " " "
Triethanolamine	Pig (1)	Mixed	3 doses/5 days,	50	No effect	Björklund and Erne 1966
	(1)		10 doses/15 days	50	"	" " " "

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING (Cont'd)

Formulation	Species (Number of test animals per group)	Sex	Dosage regime	Each dose mg/kg-body weight	Effects	References
	(1)		23 doses in 39 days	50		
	(1)		3 doses in 6 dys	300	Symptoms of poisoning	
Na salt	Guinea pig(6)	Mixed?	daily, 12 days	50, 100	1 and 3 deaths respectively, probably not significant compared to 3 deaths in control group (No symptoms of poisoning)	Hill and Carlisle 1947
(1)	(1)		51 doses in 103 days	50	Retarded growth, anorexia	" " " "
			2 doses in 4 days	300	Kidney degeneration; general inactivity	" " " "
Butyl ester	Pig (1)	Mixed	5 doses in 8 days	50	No effect	Björklund and Erne 1966
	(1)		12 doses in 17 days	50	" "	
	(1)		7 doses in 10 days	50	Symptoms of poisoning	
	(1)		23 doses in 10 days	50	e.g. muscular weakness	
	(1)		3 doses in 6 days	300	Symptoms of poisoning	
Dimethylamine	Cattle (2)	Mixed	daily, 10 days	50	No effect	Palmer 1972
	(2)			100	1 lost weight (7%)	
	(1)			175	7% weight loss	
	(1)			250	8% weight loss	
	Sheep (2)	Mixed	daily, 10 days	100	No effect	Palmer 1972
	(1)		daily, 4 days	175	Lethal	
	(2)		daily, 7 days	250	Lethal	
	Chicken (5)	Mixed	daily, 10 days	25-375	No effect or slightly reduced weight gain at 100-375	Palmer 1972
				500	Mortality 3/5; reduced weight gain in others	

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING (Cont'd)

Formulation	Species (Number of test animals per group)	Sex	Dosage regime	Each dose mg/kg-body weight	Effects	References
Triethanolamine	Rats	?	daily, 10 months	1000 in water	Depressed growth rate, no gross pathology	Björklund and Erne 1966
	Chickens (3)	Mixed	daily, 5-24 days	300	1 death at 5 days; no effect on others at 12, 24 days	"
	(?)	?	daily, from hatching through first 2 mos. of egg production	1000 in water	Egg size normal, production down 30%	"
Ethylehxyl ester	Cattle (2)	Mixed	daily, 10 days	100	No effect	Palmer 1972
	(?)	?	daily, 10 days	100	None to minor effects	Hunt et al. 1970
	(4)	?	daily, 6-14 days	250	Mortality 2/4	" " "
	(?)	?	daily, 14 days	250	111 in 3 days, survive and recover from 9 doses, 14 doses lethal	" " "
	Sheep (1-3)	Mixed	daily, 10 days	25, 50, 100	No effect, or 7-8% weight loss	Palmer, 1972
	(?)	?	daily, 17 days	250	111 in 3 days, 17 doses lethal	Hunt et al. 1970
	(6)		6-56 days	250	Mortality 3/6	Palmer, 1972
	(2)		5-10 days	500	Mortality 2/2	" "
	Chickens (1)	Mixed	daily, 10 days	100, 250, 500	Dose-dependent reduction in weight gain	" "

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING (Dietary)

Formulation	Species (Number of test animals per group)	Sex	Dosage - ppm in feed	Duration of dosing (days)	Effects	References
Acid	Rat (7)	M	100	20	No effect on growth or feeding rates	Hill and Carlisle 1947
			then 1000	10		
			200, 400	30	No effect except 1 death at 400 mg/kg diet considered incidental	
	Rat (5)	M	100, 300	113	No effect - physical appearance, chemical and histological parameters	Rowe and Hymas 1959
			1000	113	Depressed growth rate, mortality (rate not specified)	
			3000, 10,000	12	Losing weight, not eating; killed	
	Rat (50) (3-week-old)	Mixed	0-1250	2 y	No effect - growth, survival, organ weights, hematology	Hansen et al. 1971
	Dog (6) (6-8-mo-old)	Mixed	0-500	2 y	Some lesions, not attributed to herbicide	Hansen et al. 1971
	Dog	?	500	2 y	No effect	House et al. 1967
	Chicks (3)	Mixed ?	0, 500, 1000	7	No effect (no histological exam)	Rowe and Hymas 1954
			3000	7	Reduced food intake and weight gain	
Chicks (135)	M		0, 2, 10	56	Reduced weight gain at 100 mg/kg	Whitehead 1973
Chicks (270)	Mixed		100 0, 5, 10, 50	56	Reduced weight gain at 10 and 50 mg/kg; reduced food intake	

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING (Dietary) (Continued)

Formulation	Species (Number of test animals per group)	Sex	Dosage - ppm in feed	Duration of dosing (days)	Effects	References
Acid	Cattle (3)	?	0-2000	14-28	No effects reported (residues in milk, cream, meat analyzed)	Leng 1972
	Sheep (3)	?	1000, 2000	28		
Acetamide	Bobwhite (young)	?	2500	100	72% mortality of young 0% mortality of adults	DeWitt et al. 1963
	Ring-necked Pheasant (young)	?	5000	100	88% mortality (young)	" " " "
			2500	100	11% mortality (adult)	
	Mallard (young)	?	500	100	11% mortality (young)	Heath et al. 1972
	Japanese (quail) (16)	Mixed	5000	5	0% mortality (adult) No mortality	

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING

Formulation	Species (Number of test animals per group)	Sex	Dose mg/kg-body weight	Duration of dosing (days)	Effects	References
Butoxyethanol ester	Bobwhite (?)	?	5000	100	68%, 65% mortality (young adults)	DeWitt et al. 1963
	(4)	Mixed	5000	5	No mortality	Heath et al. 1972
	Pheasant (?)	?	5000	100	92% mortality	DeWitt et al. 1963
	(12)	Mixed		5	17% mortality	Heath et al. 1972
	Mallard (?)	?	5000	100	55%, 8% mortality (young adults)	DeWitt et al. 1963
	Mallard (11)	Mixed	5000	5	No mortality	Heath et al. 1972
Butoxyethyl ester	Japanese quail (14)	Mixed	5000	5	No mortality	Heath et al. 1972
	Chicks (10)	Mixed	0-1000	21	No effect on growth rate	Whitehead and Pettigrew 1972
			2000-7500	21	Reduced food intake and growth; swollen kidneys	
			5000 then 0	7 7-14	Reduced growth rate Normal growth resumed	
Dimethylamine	Bobwhite (?)	?	5000	40	Mortality 50% after total consumption of 8250 mg/kg-bw	DeWitt et al. 1963
	Pheasant (?)	?	5000	100	Mortality 50% after total consumption of 19780 mg/kg-bw	" " " "

PROLONGED & CHRONIC TOXICITY OF 2,4-D BY REPEATED ORAL DOSING

Formulation	Species (Number of test animals per group)	Sex	Dose mg/kg-body weight	Duration of dosing (days)	Effects	References
	Mallard (?)	?	2500	100	65% mortality (adults)	" " " "
			1250	100	5% mortality (adults)	" " " "
			500	100	24%, 0% mortality (young, adults)	" " " "
	Bobwhite	Mixed	5000	5	No mortality	Heath et al. 1972
	Japanese quail	Mixed	5000	5	No mortality	"
	Pheasant	Mixed	5000	5	"	"
	Mallard	Mixed	5000	5	"	"
Triethanolamine	Pigs (5)	Mixed	500	60-365	Reduced growth rate; locomotory disturbances	BJörklund and Erne 1966
	Chicken (6)	?	500	1-18 mo	1 death (5 mo)	

