2000 Report to the Legislature

Status of High and Significant Hazard Dams in Washington State with Safety Deficiencies

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Status of High and Significant Hazard Dams in Washington with Safety Deficiencies

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Executive Summary

This report updates information on the condition of the 306 dams in Washington which are situated above populated areas and are regulated by the Dam Safety Office of the Department of Ecology. The report also presents an update on progress to repair or improve dams that were found to be deficient during periodic safety inspections. The Executive Summary Figure on Page 2 illustrates the numbers and status of dams in Washington.

The following three key messages summarize the status of dam safety in Washington in 2000.

- Ecology staff continue to work with owners to repair unsafe dams. Eleven (11) dams were repaired in 1999-2000, reducing the number of unsafe projects to twenty-eight (28).

- With the current dam safety staffing, it is anticipated that *high hazard* dam inspections will barely keep up with a 6-year cycle, while inspections on *significant hazard* dams will lag further behind. Both inspection cycles are much longer than the 3-5 year cycle recommended in Federal dam safety standards.

- Population growth in Washington will continue to adversely affect dam safety. First, increased development will result in more dams being built, increasing the plan review workload for Ecology, and taking time away from periodic inspections. Second, development occurring downstream from dams will place more citizens potentially at risk from a failure and will increase the design requirements which can result in costly dam repairs.

In 1999-2000, Ecology was successful in accomplishing the following periodic inspection and remedial actions:

- Periodic inspections and detailed engineering analyses ..... 48 dams.
- Reconnaissance inspections ..... 69 dams.
- Safety deficiencies corrected by dam owners ..... 11 dams.

Progress to correct deficiencies on dams continued in 1999-2000, and the number of projects needing remedial work was reduced to 28. To date, safety deficiencies have been identified on 157 dams and actions to correct deficiencies are summarized below.

- Deficiencies have been corrected ..... 129 dams.
- Partial repairs have been completed ..... 8 dams.

High hazard dams—dams located upstream of three or more residences: The periodic inspection program utilizes a prioritization scheme that targets the larger dams where greater numbers of people could be at risk in the event of a failure. All of the 116 high hazard dams have previously been inspected and are supposed to be on a 6-year inspection cycle. However, a heavy workload in plan review and construction inspection of new projects in 1999 and 2000 resulted in fewer inspections completed than necessary to meet the 6-year inspection cycle.

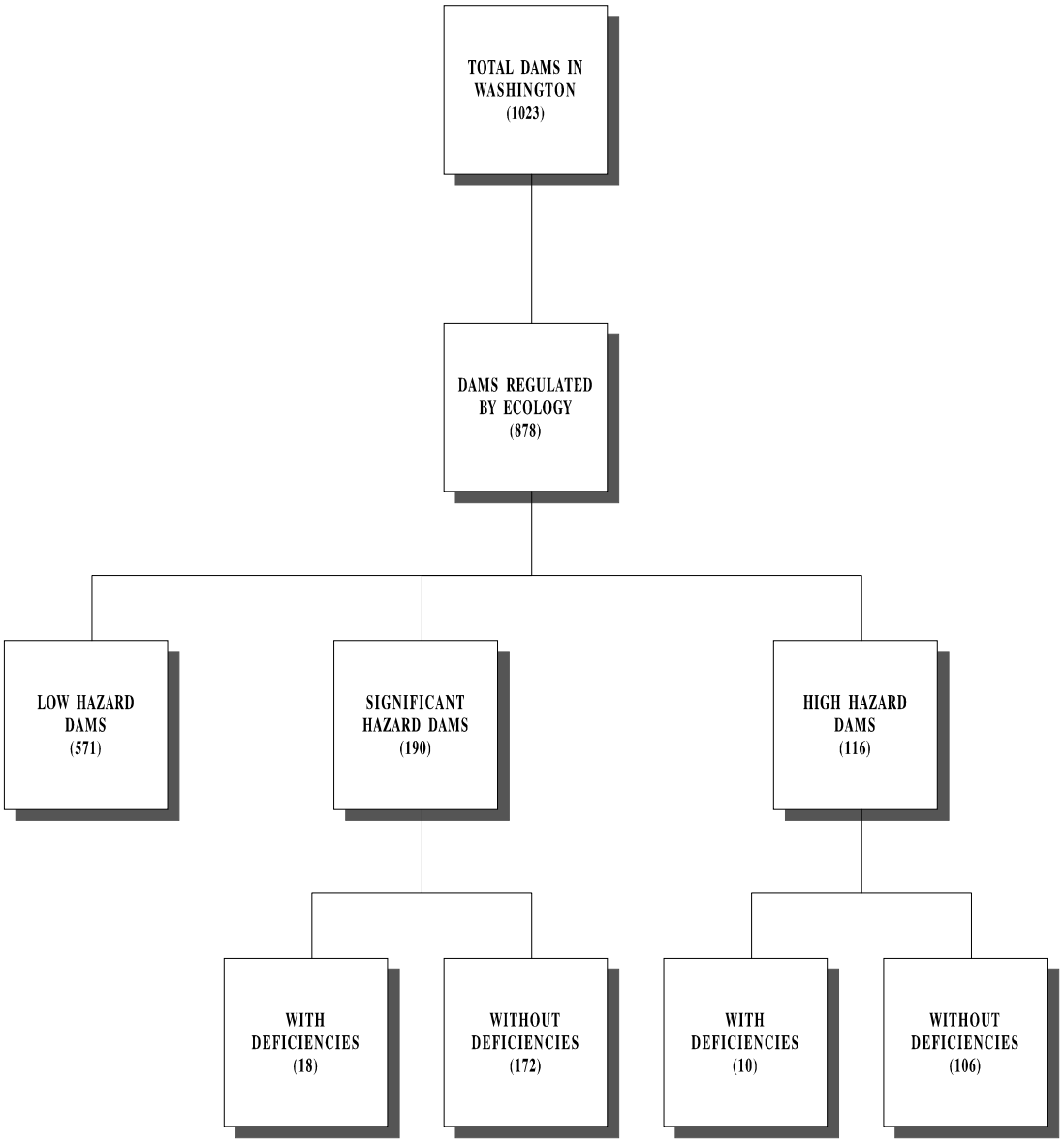
Significant hazard dams – dams located upstream of one or two homes: There are 190 significant hazard dams. These projects are supposed to be on an 8-year inspection cycle, but the heavy plan review workload has pushed the inspection cycle to 10 to 12 years.

Risk factors: It should be noted that our inspection cycles are much longer than the 3-5 year cycle recommended by Federal dam safety guidelines. The decrease in frequency of inspections means that aging, deterioration, and maintenance problems will have more time to develop between inspections, possibly threatening the safety of dams and placing citizens living downstream at greater risk. Also, new development occurring downstream from these dams will increase the number of citizens at risk from dam failure.

Future inspection cycles: In 1999 and 2000, the Federal Emergency Management Agency awarded state assistance grants to Ecology of $26,000 and $46,000 respectively under the National Dam Safety Program Act. This funding was sufficient to hire a part-time engineering intern whose primary responsibility was to inspect low hazard dams to determine if they should be re-classified because development had occurred downstream.

It is anticipated that Ecology will receive sufficient funding over the next two years from FEMA to hire a full-time entry-level engineer. This will reduce the inspection cycle on significant hazard dams to meet the goal of an 8-year frequency. However, until sufficient funding is received from federal or state sources to hire additional engineering staff, the frequency of inspections will continue to lag far behind national dam safety standards.

EXECUTIVE SUMMARY TABLE



Introduction

In accordance with RCW 90.54.160, the Washington Department of Ecology is directed to report to the legislature on dam facilities that exhibit safety deficiencies that pose a threat to the safety of life and property. Those directives also indicate that the report should identify the owner or owners of such facilities, detail the owner's ability and attitude towards correcting such deficiencies, and provide an estimate of the cost of correcting the deficiencies if a study has been completed. This information is contained in the tables in Appendix A.

This is the fifteenth of the series of reports providing information on the current status of dams with *High and Significant* downstream hazard classifications that have safety deficiencies. A dam is defined as any artificial barrier or any controlling works that can or does impound 10 acre-feet or more of water. The downstream hazard classification refers to the impact a dam failure could have on downstream lives and property, and does not relate to the structural or operational condition of a dam. Table 1 lists the classification system used by the Dam Safety Office (DSO) at the Department of Ecology.

Table 1
Downstream Hazard Classification

Downstream Hazard Potential	Downstream Hazard Class	Population at Risk	Economic Loss Generic Descriptions	Environmental Damages
Low	3	0	Minimal. No inhabited structures. Limited agriculture development.	No deleterious materials in water
Significant	2	1 to 6	Appreciable. 1 or 2 inhabited structures. Notable agriculture or work sites. Secondary highway and/or rail lines.	Limited water quality degradation from reservoir contents and only short-term consequences.
High	1C	7 to 30	Major. 3 to 10 inhabited structures. Low density suburban area with some industry and work sites. Primary highways and rail lines.	Severe water quality degradation potential from reservoir contents and long-term effects on aquatic and human life.
High	1B	31-300	Extreme. 11 to 100 inhabited structures. Medium density suburban or urban area with associated industry, property and transportation features.	
High	1A	More than 300	Extreme. More than 100 inhabited structures. Highly developed, densely populated suburban or urban area with associated industry, property, transportation and community lifeline features.	

Items of Note in 1999 and 2000

Progress continued in 1999 and 2000 on correcting safety deficiencies and upgrading the safety of dams in Washington. In addition, due to a Federal grant, we were able to hire an engineering intern which helped improve our productivity and increase the number of reconnaissance inspections over previous years. However, the number of dams repaired was only able to keep pace with new projects found to be deficient through our periodic inspection program. Furthermore, our ability to maintain a 6-year cycle for detailed inspections of high hazard dams continued to slip, due to a continued heavy workload in plan reviews and construction inspection for new projects and repairs of existing dams. This trend is expected to continue in the next few years, unless additional engineering staff can be added through federal grants or state funding.

The following items are of particular note in 1999-2000:

- 11 dams with deficiencies were repaired or modified in 1999 and 2000.

- 48 detailed inspections were conducted and 10 dams were found to have safety deficiencies that could pose a threat to life or property. This is 7 fewer dams inspected than were scheduled in 1999 and 2000 to meet the minimum 6-year inspection cycle.

- 69 reconnaissance inspections were performed on the smaller dams where there is a moderate to low potential for loss of life in the event of a dam failure. This was a considerable increase from past years and is due to funding from the Federal Emergency Management Agency (FEMA) through the National Dam Safety Program Act, PL104-303. This funding enabled us to hire an engineering intern, who worked on a project to inspect 47 low hazard dams to determine if downstream hazard potential had increased due to development. Based on these inspections a total of 6 dams were found where the downstream hazard potential had increased. These projects have now been scheduled for more detailed inspections and analyses in the near future.

- In May of 1999 the foundation under the spillway structure at Silver Lake Dam in Cowlitz County failed, resulting in a complete release of the contents of the lake. While nobody was injured by the resulting flood, the lowered lake had a significant impact on homeowners and resorts surrounding the lake. Dam Safety staff were instrumental in working with the owner and the Natural Resources Conservation Service to stabilize the spillway structure to prevent it from collapsing into the scour hole until it could be repaired. The spillway structure was subsequently repaired in September of 1999 and the lake was refilled.

- On April 20, Dam Safety staff were informed that a small dam near Ice Harbor Dam on the Snake River had failed. Since we had no record of a dam in that area, a team of engineers was dispatched to the site on April 27 to investigate the failure. The team discovered that the dam was illegally constructed and owned by Mr. Ralph Broetje, owner of a large fruit orchard surrounding the site. Apparently, since Mr. Broetje owned all the land upstream and downstream from the reservoir, he

was unaware that a state permit was required from Ecology for construction of the dam. The dam had a height of 30 feet and impounded about 12 million gallons (37 acre-feet) of water for frost protection. The dam safety team could not determine the exact cause of the failure, but it was likely due to failure of the plastic reservoir liner, leading to a washout of the dam along the alignment of the outlet conduit. The dam break flood roared down a canyon onto a bench above the Snake River where Mr. Broetje had constructed a school and housing for troubled youths. The flood inundated two of the buildings to a depth of two feet, and deposited tons of silt on the lawns, but luckily no one was injured. Mr. Broetje subsequently hired an engineer who designed repairs to the project that met state dam safety requirements. Repairs to the dam were completed in November, and the project will be put back into service next spring.

- In October 2000, repairs were completed to the Sinlahekin Dams 1, 2 and 3, which are high hazard projects in Okanogan County, owned by the Washington State Department of Fish and Wildlife (WDFW). This marked the culmination of 7 years of effort by the Dam Safety Office and the WDFW to repair their unsafe, high hazard dams. In addition to repairing these dams, WDFW obtained funding from the Legislature to begin a maintenance program for its 60 dams located around the state. As a result of their efforts, WDFW received the West Region Award of Merit from the Association of State Dam Safety Officials in 2000.

Periodic Inspection

In general, periodic inspections and follow-up engineering analyses are performed on existing dams for various purposes including: identifying obvious defects, especially due to aging; evaluating project operation and maintenance; assessing the structural integrity and stability of project elements; determining the adequacy of the spillways to accommodate major floods; and assessing the stability of the structure under earthquake conditions.

Periodic inspections are the primary tool for detecting deficiencies at dams that could lead to failure. Experience has clearly shown that correction of these safety deficiencies in a timely manner can prevent dam failures and other serious incidents from occurring. The use of periodic inspections to detect deficiencies and avert disasters continues to be an important preventative tool in the dam safety program. Periodic inspections also help identify dams where significant development has occurred downstream, resulting in the need for more stringent design loadings due to greater population at risk.

Responsibility for Inspection of Dams in Washington

Responsibility for the inspection of the 1023 dams in Washington rests with several agencies.

- Federally owned and operated dams, such as facilities owned by the U.S. Army Corps of Engineers, Bureau of Reclamation, and various agencies of the Department of Interior are inspected by dam safety units within their respective agencies. (69 dams)

- Non-federal hydropower dams, licensed by the Federal Energy Regulatory Commission (FERC) are inspected by private engineering consultants every 5 years as required by the FERC as part of hydropower licensing. (76 dams)

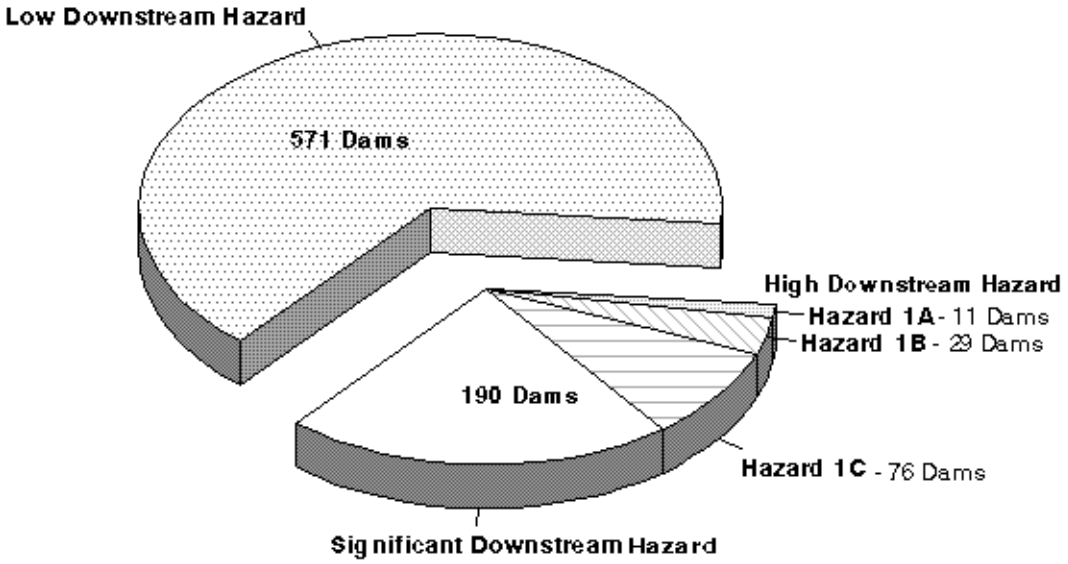
- The remaining 878 dams are the sole responsibility of the Department of Ecology under RCW 43.21A.064(2). These dams are inspected on a periodic basis by the Dam Safety Office.

Number of Dams Classified as High or Significant Downstream Hazard Potential

As stated above, there are currently 878 dams which are the sole regulatory responsibility of Ecology. Approximately 306 of these dams are situated above populated areas and are classified as having *high* or *significant* downstream hazards if they were to fail. Priority is given to the periodic inspection of these dams.

The number of dams classified as high or significant hazard potential differ slightly from those reported in prior years. This variability in the number of dams occurs as new dams are built, or as existing dams are inspected and downstream hazard classifications are upgraded to reflect current development in the downstream valley. Of these 306 dams, about 2/3 are privately owned, and 1/3 are publicly owned. The breakdown of dams by hazard classification is shown in Figure A.

Figure A
Number of Dams by Hazard Classification



878 Dams Solely Under Ecology Jurisdiction

Current Dam Safety Inspection Program

The Dam Safety Office utilizes a three tiered approach in conducting periodic inspections. This three tiered approach provides more efficient use of staff time for site inspections, conducting engineering analyses and preparing reports (Table 2). The basic concept is to allocate time and effort for engineering analyses and report preparation commensurate with the complexity of the project and the nature and severity of the suspected defects.

Table 2
Inspection Classifications

TYPE	PURPOSE	USAGE	DESCRIPTION
CLASS I	COMPREHENSIVE INSPECTION	First Periodic Inspection	Visual Inspection of all Project Elements; Detailed Engineering Analysis of Project Elements Under Extreme Flood and Earthquake; Prepare Comprehensive Report of Findings.
CLASS II	INTERMEDIATE LEVEL INSPECTION	Subsequent Periodic Inspections	Visual Inspection of all Project Elements; Some Engineering Analysis of Selected Elements; Prepare Summary Report of Findings.
CLASS III	RECONNAISSANCE INSPECTION	Preliminary Inspection	Visual Inspection of Most Project Elements; Minimal Engineering Analyses; Prepare Memo to File Summarizing Inspection.

In employing the three tiered approach, priority is given to inspection of the largest dams with the greatest number of citizens at potential risk. For these dams, comprehensive inspections are performed on a 6-year cycle and detailed engineering reports are prepared for transmittal to the dam owner. In 1999 and 2000, a total of 48 comprehensive Class I and II inspections were completed, and 10 dams were added to the list of dams with deficiencies.

Reconnaissance inspections are conducted on those smaller dams where there is a moderate to low potential for loss of life in the event of a dam failure. For these dams, the primary intent is to identify any situations that pose an imminent hazard, or where population growth has occurred in the downstream floodplain. A total of 69 reconnaissance inspections were performed, primarily on Hazard 3 Dams between 10 and 20 feet in height. Six of these dams were found to have an increased downstream hazard classification A summary of the periodic inspection activity over the last 10 years is provided in Figure B.

Up to this point, the report has focused on the identification of dams with deficiencies and progress in correcting those deficiencies. Figure C has been prepared to give a broader perspective of the periodic inspection program for dams situated above populated areas. It summarizes the number of dams that are in satisfactory condition relative to the number of dams with deficiencies. This chart shows that most of the dams above populated areas are in satisfactory condition, but there is still a significant number of dams that are in need of repairs.

Figure B
Summary of Periodic Inspection Activity Since 1990

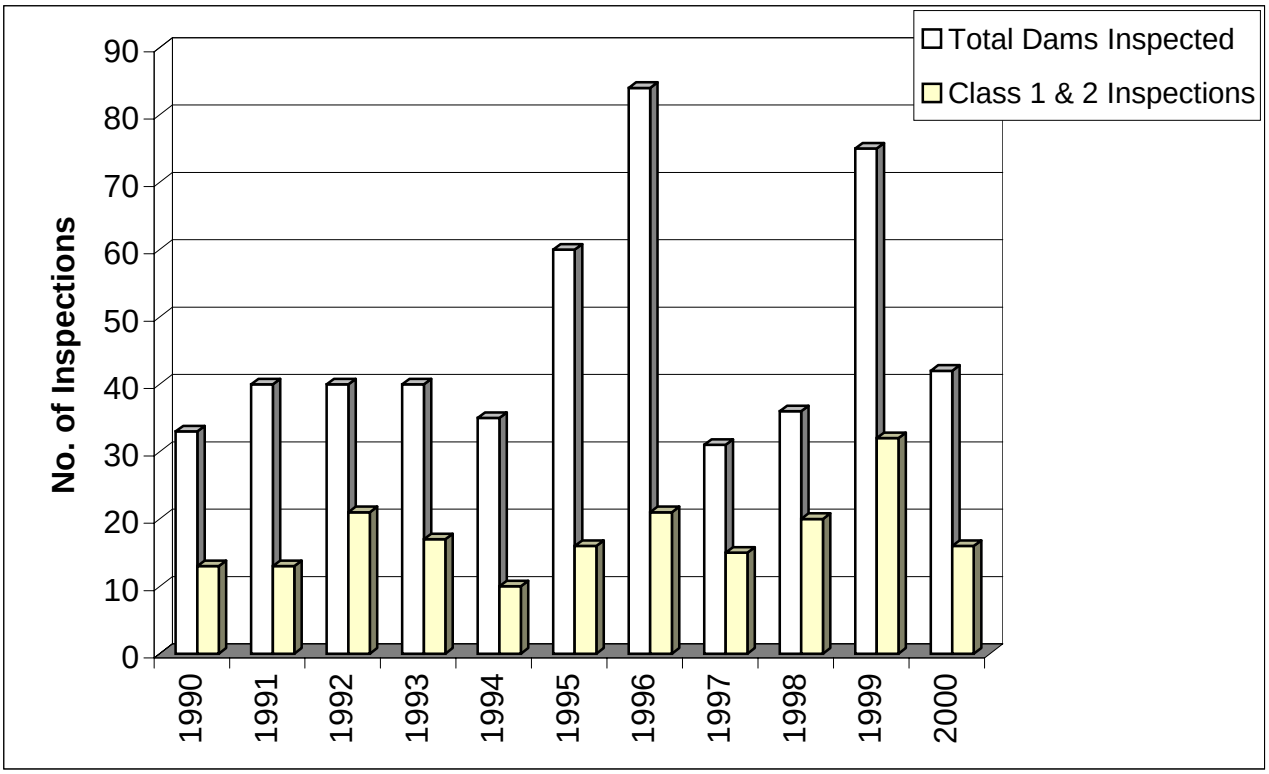
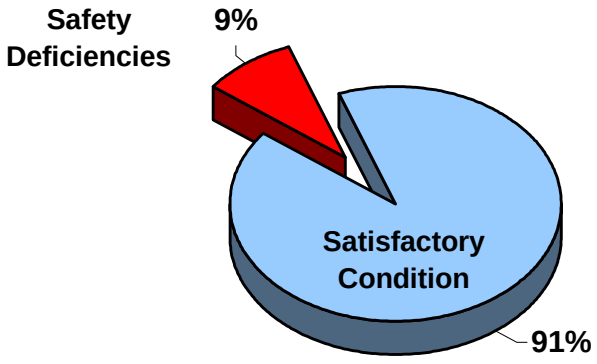


Figure C
Condition of Dams Above Populated Areas in Washington - 2000



306 Dams
High and Significant
Hazard Potential

Remedial Activity

Progress in Repairs to Dams during 1999-2000

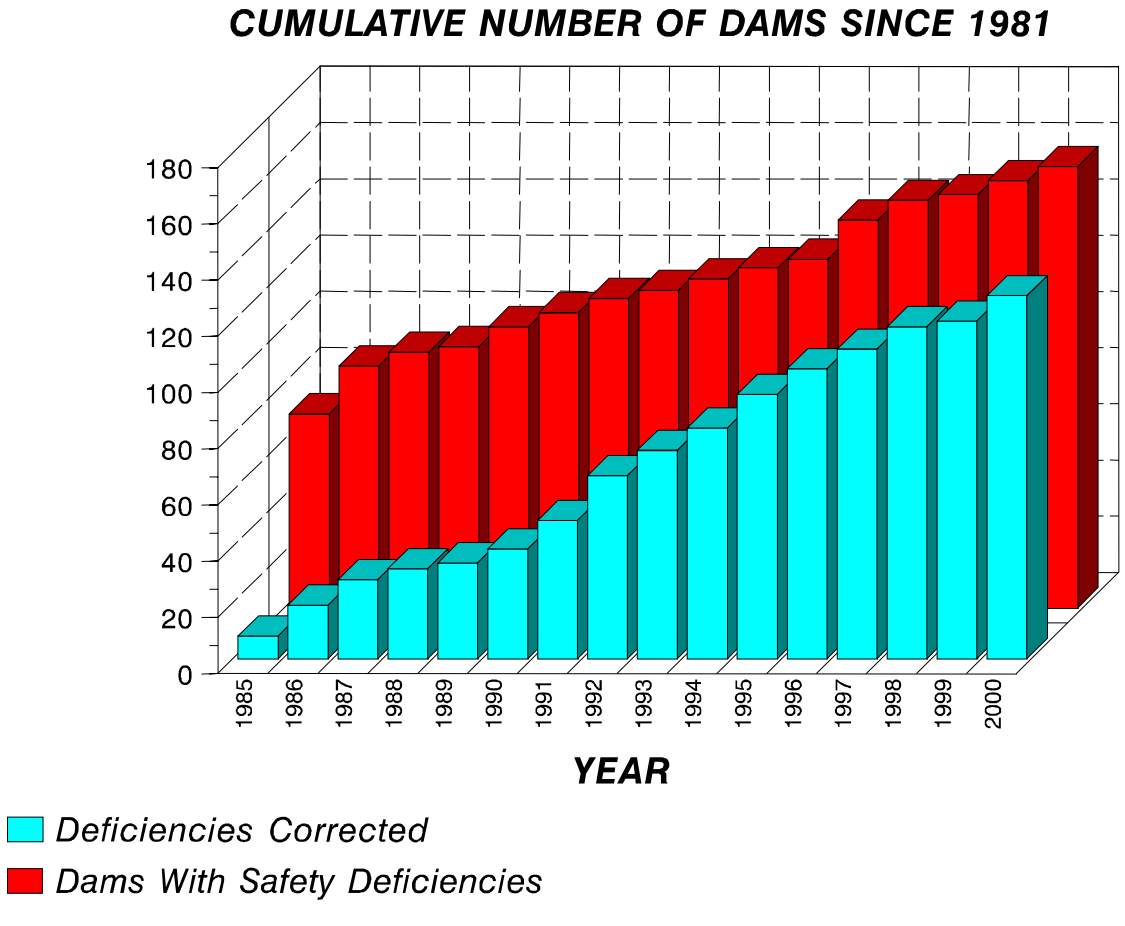
Based on inspections performed in 1999 and 2000, ten dams were added to the list of dams with safety deficiencies. Due to this increase, only minor progress was made in reducing the backlog of projects in need of remedial work. A total of 11 dams were removed from the list of dams with deficiencies because remedial work was completed. Partial repairs were also initiated at three dams during the past two years. Table 3 summarizes the dams where repairs were completed during 1999-2000.

Table 3
Dams Repaired or Modified in 1999-2000

COUNTY	PROJECT AND DAM NAME	OWNER
KING	Tuck Lake Dam	Tuck Lake Homeowners Association
LINCOLN	Little Falls Dam	Avista Corporation
OKANOGAN	Patterson Lake Dam	Wolf Creek Reclamation District
	Sinlahekin Dams Nos. 1, 2, and 3 (Forde, Reflection & Connor Lakes)	Washington State Department of Fish & Wildlife
SNOHOMISH	Chaplain Lake North & South Dams	City of Everett
SPOKANE	Hog Lake Dam	Washington State Department of Fish & Wildlife
STEVENS	Ponderosa (Baker Lake) Dam	Beryl & Jay Baker
	Matney Dam	Mike Matney

Based on this progress, remedial work has now been completed on 129 of the cumulative 157 dams that have been identified since 1981 as having safety deficiencies (Figure D). In addition, partial repairs have now been completed on 8 dams. As shown in Figure D, progress is still being made in closing the gap in repairing dams with safety deficiencies. However, this progress has slowed because ongoing inspections are adding nearly as many new dams with deficiencies to the list as are being removed from the list by being repaired. This is largely due to the problem of older dams not meeting higher safety standards due to population growth, but is also due to increasing seismic standards, aging of manmade materials, and lack of maintenance.

Figure D
Cumulative Summary of Corrective Action



Conclusions

There are currently 306 dams in Washington which are sited above populated areas where Ecology is the sole regulatory agency. Nearly all of the 116 dams located upstream of three or more residences (high downstream hazard potential) have previously been inspected and are now supposed to be on a 6-year inspection cycle. The first round of inspections for the 190 dams classified as having a significant downstream hazard has also been completed, and these projects are supposed to be on an 8-year inspection cycle. However, due to a heavy workload in plan review and construction inspection, as well as increased complexity and uncertainty in seismic analysis of dams in Washington, the Dam Safety Office has been unable to maintain these inspection frequencies.

Furthermore, most state and Federal dam safety agencies perform inspections on these high and significant hazard dams on no more than a 3 to 5 year cycle. Ecology currently only has sufficient staff to maintain the 6-year inspection cycle on the dams with high downstream hazards, leaving the significant hazard dams to be inspected on a 10 to 12-year cycle.

Funding through the National Dam Safety Program for Ecology to hire an entry-level engineer will help somewhat toward reducing the inspection cycle. However, this funding will not help us reduce the inspection cycle to meet the 3 to 5 year standard used by other dam safety agencies. This means that for many dams, aging, deterioration and maintenance problems will have more time to develop between inspections, possibly threatening the safety of the dams and threatening public safety. In addition, development will be occurring downstream of these dams, placing more citizens at risk from dam failure.

Progress to correct deficiencies on dams continued in 2000, but the gap between dams with deficiencies and those that have been repaired did not narrow significantly. This is largely due to the problem of older dams not meeting higher safety standards due to population growth, but is also due to increasing seismic standards, aging of manmade materials, and lack of maintenance. To date, safety deficiencies have been identified on a cumulative 157 dams, and actions to correct deficiencies are summarized below.

- Deficiencies have been corrected ..... 129 dams.
- Partial repairs have been completed ..... 8 dams.
- Engineering studies and/or design work is underway ..... 6 dams.

The number of dams where owners have been unresponsive decreased in 2000 from 14 to 8 projects. This change was due to some owners finally obtaining funding after several years of waiting, and also a few owners taking the initiative to repair their dams without enforcement by the department. The remaining 8 projects are still on a prioritized schedule for compliance. Should an owner continue to be unresponsive, the Department may issue regulatory orders and/or penalties. If an emergency situation exists, the Department may physically reduce the hazard and charge the owner for costs incurred.

In 1999 and 2000, the Federal Emergency Management Agency, Ecology received state funding assistance of about $26,000 and $46,000 respectively, under the National Dam Safety Act of 1996.

This funding was sufficient to hire a part time engineering intern whose primary responsibility was to inspect low hazard dams to determine if they should be re-classified because development had occurred downstream. It is anticipated that Ecology will receive an additional $46,000 per year over the next two years from FEMA which will allow us to hire an entry level engineer on a project basis. This will reduce the inspection cycle on significant hazard dams to meet the goal of an 8-year frequency. However, until additional funding is received from federal or state sources to hire sufficient engineering staff, the frequency of inspections will continue to lag far behind the standards established by the National Dam Safety Act.

This shortcoming not only places citizens of the state at greater risk from a dam failure, it will increase the state's liability exposure because of its statutory responsibility for dam inspection. Until such funding can be secured, the department will continue to prioritize its efforts toward repairing unsafe dams with the greatest population at risk, and maximizing the productivity of current staff to reduce the inspection cycles as much as practicable.

Appendix A - Project Status

The status of the remaining projects with uncorrected deficiencies as identified during the Ecology inspections prior to 1999 is provided in Table I. The dams identified as having deficiencies in 1999 and 2000 are shown in Table II.

Within these tables, individual projects are listed by county location and project name in alphabetical order. The dam identification numbers are also provided as listed in the state inventory of dams. Project owners are listed next, followed by a brief description of the identified major safety deficiencies. The status of activity, reflecting, in part, the owners' attitude to make the needed repairs or modifications, is indicated by the following letter codes.

C - Deficiencies corrected

I - Some deficiencies corrected-necessary modification incomplete

S - Action started but currently not progressing

P - Action started and studies and/or work progressing satisfactorily

A - Informal enforcement action initiated (i.e., advisory/warning letter)

R - Formal enforcement action initiated (i.e., regulatory order issued)

N - No response or progress

L - Regulatory order appealed to Pollution Control Hearings Board or in litigation

The final columns in the tables provide information on rehabilitation or modification costs. Where no detailed engineering assessment was available, an estimated cost range was provided based on an assumed range of probable options that may come under consideration. These figures are shown to indicate the relative order of magnitude of the problem and, necessarily, cannot be assumed to be highly reliable.

Projects where remedial work was completed in years prior to 1998 have been removed from this report. For a listing of these projects, please refer to the 1996 Report to the Legislature.

TABLE I

PROJECT REHABILITATION STATUS SUMMARY OVER LAST 3 YEARS
(DAMS INSPECTED PRIOR TO 1999)

County I.D. No.	Project Name	Owner	Safety Deficiencies	Status/Attitude 1998	Status/Attitude 1999	Status/Attitude 2000	Estimated Repair Cost $ Thousands	Repairs Completed	Population at Risk
CHELAN									
77	Mathison Dam	Thomas K. Mathison & Ralph Hedges	Embankment stability,seepage	P	S	S	10-30	None	2-5
235, 412	Wenatchee Heights Dam No. 1 & Saddle Dam	Wenatchee Heights Reclamation District	Embankment Stability, Seepage	S	S,A	S,A	10-70	None	1-5
FERRY									
622	Grouden Dam	U.S. Forest Service	Inadequate Spillway Capacity	S	S	S	10-100	None	6-12
KING									
180	Tuck Lake Dam	Tuck Lake Homeowners Association	Outlet Conduit Deterioration	A,P	P	C	30-40	Complete	10-15
236	Lake Margaret Dam	Lake Margaret Community Purposes Club	Inadequate Spillway Capacity	P	S,I	P,I	10-30	Partial	15-20
KITSAP									
188	Tahuya Lake Dam	Lake Tahuyeh Community Club	Inadequate Spillway Capacity	P	P	P	100	None	60+
LINCOLN									
69	Little Falls Dam	Washington Water Power	Barrier Stability, Penstock Deterioration	P,I	P,I	C	200-300	Complete	1-3
MASON									
89	Timberlakes Dam	Timberlakes Homeowners	Outlet Conduit Deterioration	P	P	S	60	None	1-6
OKANOGAN									
40	Fanchers Dam	Cascade Ranches, Inc. Olma Brothers Corp.	Inadequate Spillway Capacity Embankment Stability,Seepage	P,I	P,I	S,I	30-70	Partial	15-20
329	Beth Lake Dam	USDA National Forest Service	Inadequate Spillway Capacity	S	S	S	20-40	None	6-10
5, 6, 7	Sinlahekin Dams No. 1, 2, 3	Wash. State Dept. of Fish and Wildlife	Inadequate Spillway Capacity	P	P	C	600	Complete	18-36

C = Deficiencies Corrected; I = Some deficiencies corrected, but incomplete; S = Action started but currently not progressing; P = Progressing satisfactorily
A = Informal enforcement action; R = Regulatory Order issued; N = No response or progress; L = Litigation; F = Inadequate funding for repairs by owner

TABLE I (continued)

County I.D. No.	Project Name	Owner	Safety Deficiencies	Status/Attitude 1998	Status/Attitude 1999	Status/Attitude 2000	Estimated Repair Cost $ Thousands	Repairs Completed	Population at Risk
OKANOGAN									
73	Patterson Lake Dam	Wolf Creek Reclamation District	Stilling Basin Deterioration	P	P	C	10	Complete	3-6
PACIFIC									
522	Indian Creek Dam	City of Ilwaco	Inadequate Spillway Capacity	S	S	P,I	20	Partial	1-3
PEND OREILLE									
1123	Cedar Creek Reservoir Dam	Town of Ione	Cracking and Deterioration of Concrete, Structural Stability, Spillway Adequacy	S	S	S	20-30	None	10
SKAGIT									
382, 383, 384	Cultus Mountain Dams A, B and C	Evergreen Council, Boy Scouts of America	Spillway Rehabilitation, Seismic Stability	S	P	P	10-70	None	3-10
183	Judy Reservoir Dam B	Skagit County PUD No.1	Inadequate Spillway Capacity Conduit Leakage	P,I	P,I	P,I	9,000	Partial	30-50
1160	Lang Dam No. 1	Harry Lang	Inadequate spillway capacity embankment stability,seepage	N	N	N	5-10	None	5-10
141	Nookachamps Hills Dam	MV Associates	Inadequate spillway capacity embankment stability	S,I	S,I	S,I	30-50	Partial	3-6
SNOHOMISH									
196,197	Chaplain Lake North and South Dams	City of Everett	Liquefaction of Embankments During Earthquake	P	P	C	600	Complete	300+
SPOKANE									
56	Hog Lake Dam	Washington State Dept. of Fish & Wildlife	Inadequate spillway capacity, seepage, outlet	P,I	C	C	250	Complete	8-12
STEVENS									
41	Ponderosa Dam	Kedric Baker	Embankment erosion, seepage Spillway adequacy	S,I	P,I	C	50	Complete	3-6
373	Matney Dam	Frank Matney	Inadequate Spillway Capacity	P,I	C	C	20	Complete	15-20
1308	Blue Gulch Reservoir	Richard Hurst	Barrier Stability, Inadequate Spillway	P,I	P,I	P,I	20	Partial	1-3

C = Deficiencies Corrected; I = Some deficiencies corrected, but incomplete; S = Action started but currently not progressing; P = Progressing satisfactorily
A = Informal enforcement action; R = Regulatory Order issued; N = No response or progress; L = Litigation; F = Inadequate funding for repairs by owner

TABLE II
PROJECT REHABILITATION STATUS SUMMARY
(DAMS INSPECTED BY DAM SAFETY SECTION IN 1999 & 2000 AND FOUND TO HAVE DEFICIENCIES)

County I.D. No.	Project Name	Owner	Safety Deficiencies	Status/Attitude 2000	Estimated Repair Cost $ Thousands	Repairs Completed	Population at Risk
CHELAN							
81	Antilon Lake Dam	Lake Chelan Reclamation District	Seismic Stability, High Lake Level	A,P,I	20	Partial	10-30
GRAYS HARBOR							
663	College Hill Reservoir	City of Hoquiam	Seismic Stability Issues	A,P	50-100	None	50-100
KLICKITAT							
446	Johnson Creek Reservoir	Jim Meduna	Spillway Eroison	P	10-30	None	1-3
SAN JUAN							
444	Roache Harbor Lake Dam	Roache Harbor Water Co.	Inadequate Spillway Capacity	P	100	None	
SKAMANIA							
89	Trout Creek Dam	U.S. Forest Service	Questionable Barrier Stability During Flood	A,P	100-150	None	6-10
SPOKANE							
50	Reflection Lake South Dam	Reflection Lake Homeowners Assoc.	Inadequate Spillway Support Serious Maintenance Defic.	A,P	20	None	6
WHATCOM							
522	Lummi Island Estates Dam	Lummi Island Estates Homeowners	Seepage and Piping through Dam Embankemnt	A,P	30-70	None	1-3
1204	Holiday (Swim) Lake Dam	Lummi Island Estates Homeowners	Inadequate Spillway Capacity	A,P	10	None	1-3
YAKIMA							
1809	Berghoff Dam	Dwight Berghoff	Inadequate Spillway Capacity	P,I	20-30	Partial	3-6
1010	Stevenson Dam	Robert White	Inadequate Spillway Capacity	A,P	20-50	None	3-6

C = Deficiencies corrected; I = Some deficiencies corrected, but incomplete; S = Action started but currently not progressing; P = Progressing satisfactorily A = Informal enforcement action; R = Regulatory Order issued; N = No response or progress; L = Litigation; F = Inadequate Funding for repairs by owner.