



## **2006 Report to the Legislature:**

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

December 2006

Publication No. 06-11-047

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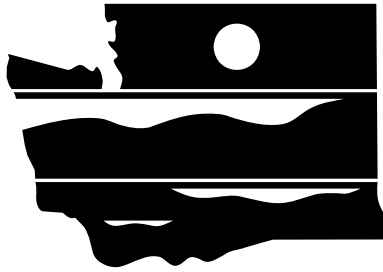
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WASHINGTON STATE  
DEPARTMENT OF  
E C O L O G Y

## 2006 Report to the Legislature:

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

*by*  
*Doug Johnson*

Water Resources Program  
Dam Safety Office  
PO Box 47600  
Olympia, Washington 98504-7600

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## Executive Summary

This report updates information regarding the condition of 333 dams in Washington that are situated above populated areas and regulated by the Department of Ecology's Dam Safety Office. The report also updates the progress to repair or improve dams found to be deficient during previous 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 2006:

- In 2005-06, for the first time in several years, more projects were repaired and removed from the list of dams with deficiencies than were added to the list from periodic inspection activity. The cause of this improvement is due primarily to several multi-phased repair projects being finished over the last two years. Eight dams were added to the list of dams with deficiencies through our periodic inspection activity. More dams are being added to the list following inspections. Aging dams are deteriorating and not meeting higher safety standards due to population growth, increasing seismic standards, aging of manmade materials, and lack of maintenance. This was evidenced by incidents that happened in 2006 with three dams developing serious problems that required emergency repairs.
- Total repair costs for the 28 dams currently listed as having safety deficiencies is estimated to be more than \$1 million. Unless state or federal funding becomes available for repairing and maintaining existing infrastructure, many owners will not be able to afford repairs. The gap between dams with deficiencies and those that have been repaired will continue to widen. In those cases where an imminent threat of loss of life exists from an unsafe dam, Ecology is authorized to take emergency action and eliminate or mitigate the hazard, charging the costs back to the owner. In the remaining cases where the deficiencies are serious but do not represent an imminent threat, it is up to the owners to come up with funding to complete the repairs. While legislation has been introduced in Congress to create a federal loan fund for repairing the nation's unsafe publicly-owned dams, no funding programs are on the horizon for privately owned dams. Until funding can be secured, Ecology will continue to prioritize its efforts toward ensuring that unsafe dams which have the greatest number of downstream lives at risk are repaired. The department will work closely with owners providing technical assistance to find innovative ways to reduce the cost of making these necessary repairs.
- Since 2003, Ecology has been collecting fees from dam owners for periodic inspection of existing dams. The revenue from the fees partially offsets the costs of operating the dam safety program, and allowed Ecology to increase staffing by one engineer. This additional staffing has allowed us to reduce the inspection cycle on high hazard dams to five years as recommended in federal dam safety standards, and retain a 10-year inspection cycle for significant hazard dams. As a result, Ecology has been able to meet the inspection workload required to achieve these cycles in 2005-06.

In 2005-2006, Ecology completed or oversaw:

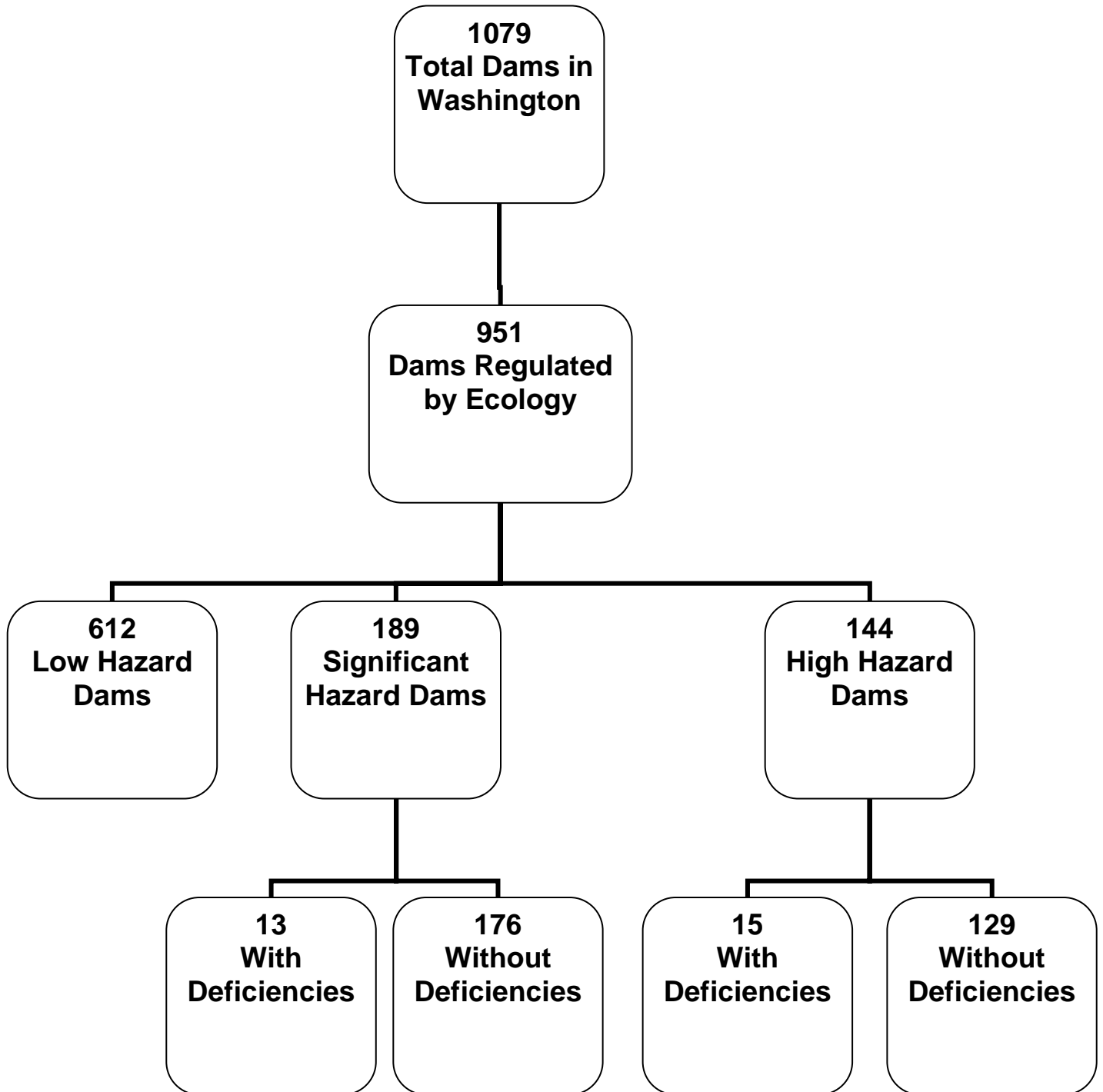
- 51 inspections of high hazard dams
- 32 inspections of significant hazard dams
- 11 safety deficiencies corrected by dam owners

Progress to correct deficiencies on dams increased in 2005-2006 because the number of projects needing remedial work actually decreased from 31 to 28. To date, safety deficiencies have been identified cumulatively on 179 dams and actions to correct deficiencies include:

- Deficiencies at 151 dams have been corrected
- Partial repairs at 6 dams have been completed

Progress has been made in closing the gap of repairing dams with safety deficiencies, but ongoing inspections are still adding a significant number of dams with deficiencies to the list.

# Executive Summary Chart



# Introduction

In accordance with RCW 90.54.160, the Washington Department of Ecology is directed to report to the Legislature regarding dam facilities that exhibit safety deficiencies and pose a threat to the safety of life and property. Under state law, the report also identifies dam owners, details their ability and attitude toward correcting any deficiencies, and provides an estimate of costs to correct the deficiencies if a study has been completed. This information is contained in the tables of **Appendix A**. This is the seventeenth report completed by the Ecology that provides 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 impounds or has the ability to impound at least 10 acre-feet of water. The downstream hazard classification refers to the potential effects a dam failure could have on people and property downstream from a dam and does not relate to the structural or operational condition of a dam. **Table 1** lists the classification system used by the Department of Ecology’s Dam Safety Office (DSO).

**Table 1: Downstream Hazard Classification**

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

## Items of Note in 2005 and 2006

Progress continued in 2005 and 2006 to inspect dams and to correct safety deficiencies, and upgrade the safety of dams in Washington. During this period, Ecology performed 83 dam inspections which achieved a five-year cycle on high hazard dams and a 10-year cycle on significant hazard dams. We also saw repairs completed on 11 dams with deficiencies. However, the number of dams repaired was still only able to keep pace with new projects found to be deficient through our periodic inspection program. Fewer dams are being repaired because funding is not readily available to the owners. At the same time, more dams are being added to the deficiency list due to population growth, increasing seismic standards, aging of man-made materials and lack of maintenance.

The following items are of particular note in 2005-2006:

- Nine dams with deficiencies were repaired or modified.
- Fifty-one detailed inspections were conducted of high hazard dams and four projects were found to have safety deficiencies that could pose a threat to life or property
- Thirty-two inspections were performed on the significant hazard dams where there is a moderate potential for loss of life in the event of a dam failure.
- A 20 foot long section of Dohman Creek Dam's crest collapsed into a 15-foot deep sinkhole during the first week of February 2006. This 23-year old dam is the main water supply for the City of Long Beach and is critical to meet demand once the tourist season starts in May. The sinkhole was centered over the low level outlet pipe alignment. The void in the embankment interior formed as the result of soils eroded through holes in the low level outlet pipe. Those holes were the result of the "aggressive" reservoir waters, that is, the water had a high potential to strip metal ions out of the conduit. The design, bid process and fix were accomplished within four months. The work involved draining the reservoir, open cutting the dam, installing a concrete encased conduit and restoring the dam section.
- During first filling in April 2006, a seep developed in the 118-year old Clear Lake Dam embankment, located in the Stemilt basin above Wenatchee. Under Ecology's direction, the Stemilt Irrigation District took emergency measures and immediately lowered the reservoir level. Investigations in the summer revealed a wet, organic layer within the embankment that appeared to be the conduit for the seepage. Repairs involved the installation of a cement-bentonite slurry wall to serve as a seepage cut off some 15 feet deep and 300 feet long. Repairs were completed in November 2006.
- On May 17, 2006, Forde Lake Dam, a high hazard dam owned by the Washington Department of Fish and Wildlife (WDFW) located in the Sinlahekin Wildlife Area near Loomis, experienced a near failure of its emergency spillway. Heavy rains and snowmelt caused severe flooding along Sinlahekin Creek. The main spillway at Forde Lake became plugged with debris, causing nearly the entire flow of the creek to pass down the emergency overflow spillway. Within three hours, the flow had eroded a gully some 10 feet deep and several hundred feet long, washing out

the county road and nearly eroding back to the edge of the lake. Ecology and WDFW took emergency action to temporarily repair the erosion damage and protect the reservoir from breaching. WDFW is now working on a permanent fix to prevent this event from reoccurring.

- In 2005 and 2006, through FEMA, Ecology received state funding assistance of about \$46,000 per year under the National Dam Safety Act. This funding was used to continue work on scanning all of our irreplaceable paper files to create electronic images of the information. The funding was also used to work on improving our Emergency Action Plans.

## 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.
- 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. 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 1,079 dams in Washington rests with several agencies.

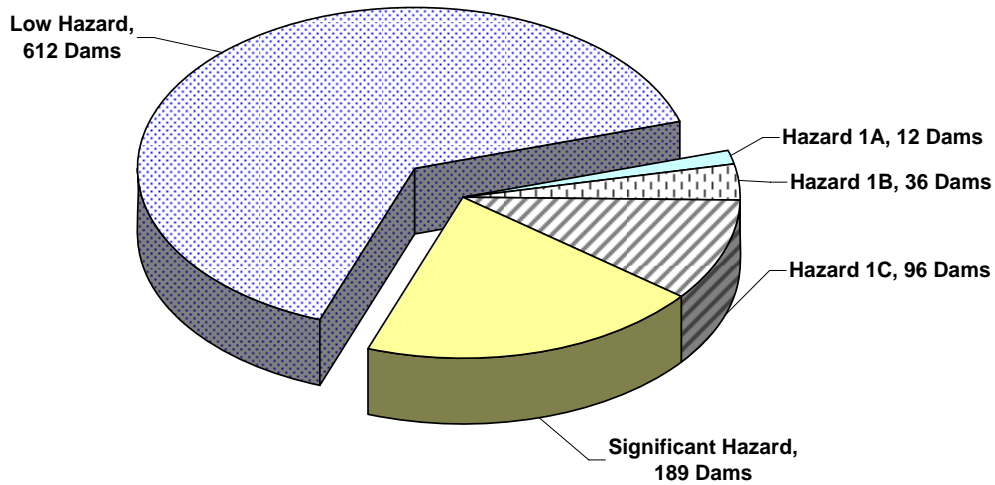
- Federally-owned and operated dams, such as facilities owned by the U.S. Army Corps of Engineers, Bureau of Reclamation, and various agencies of the Department of Interior are inspected by dam safety units within their respective agencies. (69 dams)
- Non-federal hydropower dams, licensed by the Federal Energy Regulatory Commission (FERC) are inspected by private engineering consultants every five years as required by the FERC as part of hydropower licensing. (59 dams)
- The remaining 951 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 951 dams which are the sole regulatory responsibility of Ecology. A total of 333 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 differs 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 333 dams, about two-thirds are privately owned, and one-third are publicly owned. The breakdown of dams by hazard classification is shown in Figure A.

**Figure A: Number of Dams by Hazard Classification**



## Current Dam Safety Inspection Program

The Dam Safety Office conducts periodic inspections of particular projects to reasonably secure safety to life and property, as authorized under RCW 43.21A.064. In 2004, the Dam Safety Office formalized its periodic inspection program with the adoption of WAC 173-175-705. Under this program, inspections are performed on dams where there is the potential for loss of life and significant property damage in the event of a dam failure. Dam with *high* hazard classifications are to be inspected on a 5-year cycle, while dams with *significant* hazard classifications will be inspected on a 10-year cycle. Dams classified as *low* hazard are not included in the periodic inspection program.

The inspections are performed by professional engineers from the Dam Safety Office and involve:

- Review and analysis of available data on the design, construction, operation, and maintenance of the dam and its appurtenances.
- Visual inspection of the dam and its appurtenances.
- Evaluation of the safety of the dam and its appurtenances, which may include assessment of the hydrologic and hydraulic capabilities, structural stabilities, seismic stabilities, and any other condition which could constitute a hazard to the integrity of the structure.
- Evaluation of the downstream hazard classification.
- Evaluation of the operation, maintenance, and inspection procedures employed by the owner and/or operator.
- Review of the emergency action plan for the dam including review and/or update of dam breach inundation maps.

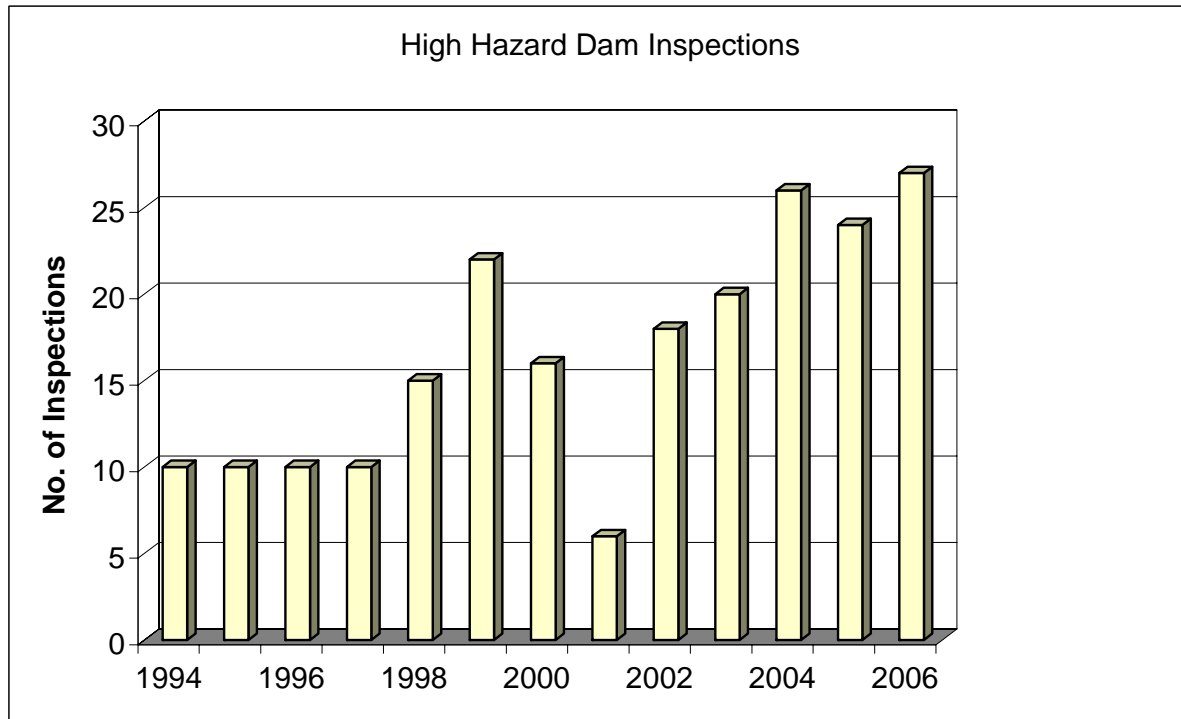
The Dam Safety Office prepares a comprehensive report of the findings for the owner, which includes findings from the inspection, and any required remedial work to be performed.

In 2005 and 2006, a total of 51 high hazard dams were inspected, and five dams were found to have serious deficiencies.

Inspections are also 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 32 such inspections were performed, primarily on Hazard 2 dams.

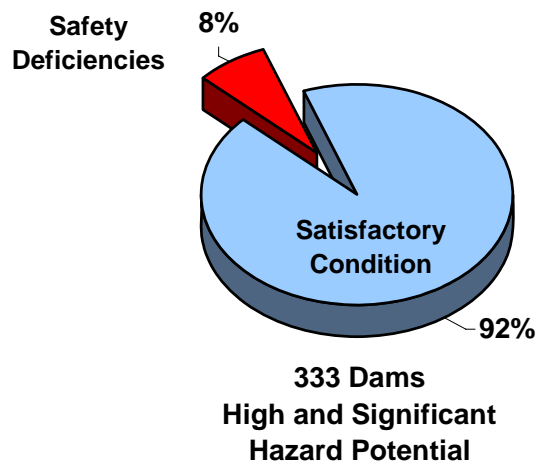
A summary of the high hazard dam inspection activity over the last 12 years is provided in Figure B. As can be seen in the figure, the level of high hazard dam inspection activity has increased over the past three years, largely due to the hiring of a new dam safety engineer.

**Figure B: Summary of Periodic Inspection Activity Since 1994**



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 are still a significant number of dams that are in need of repairs.

**Figure C: Condition of Dams Above Populated Areas in Washington - 2006**



# Remedial Activity

## Progress in Repairs to Dams during 2005-2006

Based on inspections performed in 2005 and 2006, eight dams were added to the list of dams with safety deficiencies. Despite this increase, progress was made in reducing the backlog of projects in need of remedial work, as 11 dams were removed from the list after remedial work was completed. Table 3 summarizes the dams where repairs were completed during 2005-2006.

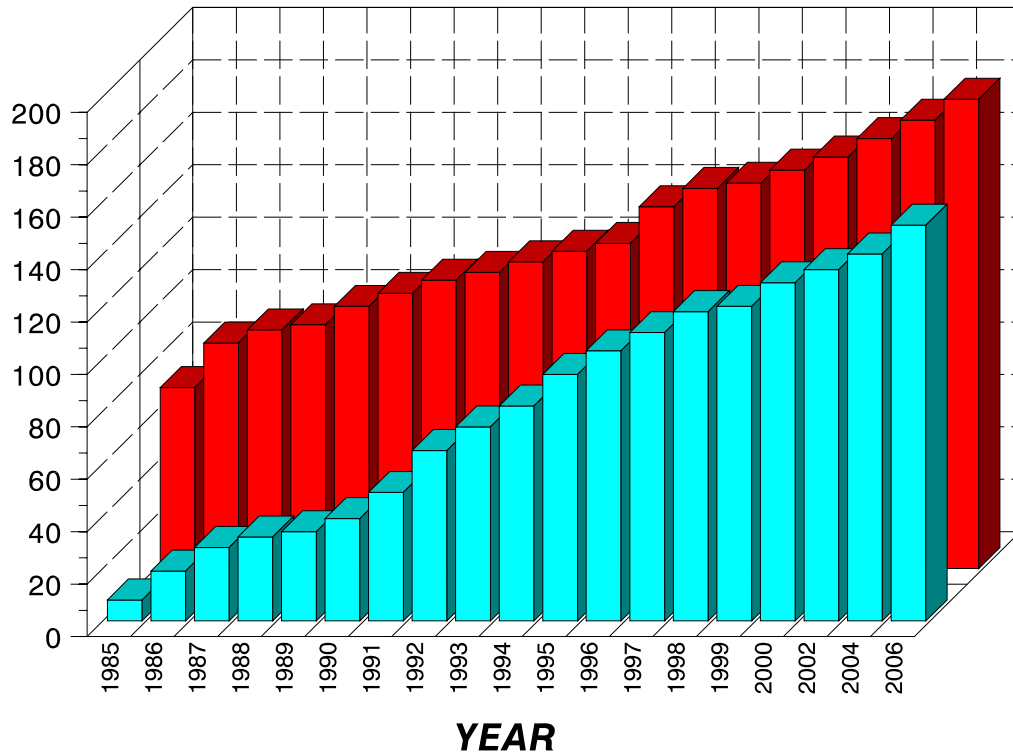
**Table 3: Dams Repaired or Modified in 2005-06**

| County   | Project and Dam Name          | Owner                                      |
|----------|-------------------------------|--|
| CHELAN   | Clear Lake Dam                | Stemilt Irrigation District                |
|          | Wenatchee Heights Reservoir 1 | Wenatchee Heights Reclamation District     |
| CLARK    | Esteb Reservoir Dam           | Orville Esteb                              |
| KING     | Welcome Lake Dam              | Lake of the Woods Homeowners Association   |
| OKANOGAN | Aspen Lake Dam                | WDFW                                       |
|          | Fanchers Dam                  | Cascade Ranches, Olma Brothers Corporation |
|          | Beth Lake Dam                 | US Forest Service                          |
| PACIFIC  | Dohman Creek Dam              | City of Long Beach                         |
| SPOKANE  | Reflection Lake South Dam     | Reflection Lake Homeowners Association     |
| STEVENS  | Blue Gulch Reservoir          | Richard Hurst                              |
|          | Serenity Lake Dam             | Stan & Sandra Long                         |

Remedial work has now been completed on 151 of the cumulative 179 dams that have been identified since 1981 as having safety deficiencies (Figure D). In addition, partial repairs have been completed on six dams. As shown in Figure D, progress has resumed in closing the gap in repairing dams with safety deficiencies, because more dams with deficiencies are being repaired than are being added to the list. This is largely because aging dams are not meeting higher safety standards due to population growth, increasing seismic standards, aging of man-made materials, and lack of maintenance.

**Figure D: Cumulative Summary of Corrective Action**

**CUMULATIVE NUMBER OF DAMS SINCE 1981**



- Deficiencies Corrected
- Dams With Safety Deficiencies

## Conclusions

There are now 333 dams in Washington sited above populated areas for which Ecology’s Dam Safety Office is the sole regulatory agency. All of the 144 dams located upstream of three or more residences (high downstream hazard potential) have been inspected at least once and are now on a five-year inspection cycle. The first round of inspections for the 189 dams classified as having a significant downstream hazard has also been completed, and these projects are on a 10-year inspection cycle. Thanks to the addition of a new dam safety engineer in 2004, the Dam Safety Office is now meeting the inspection workload required to achieve these cycles. This resulted in 51 inspections of high hazard dams, and 32 inspections of significant hazard dams.

In 2005-06, for the first time in several years, more projects were repaired and removed from the list of dams with deficiencies than were added to the list from periodic inspection activity. The cause of this improvement is primarily due to several multi-phased repair projects being finished over the last two years. Eight dams were added to the list of dams with deficiencies through our periodic

inspection activity. More dams are being added to the list following inspections because aging dams are deteriorating and not meeting higher safety standards due to population growth, increasing seismic standards, aging of manmade materials, and lack of maintenance. This was evidenced by the incidents that happened in 2006 with three dams developing problems that required emergency repairs. It is anticipated that unless state or federal funding becomes available for repairing and maintaining existing infrastructure, the gap between dams with deficiencies and those that have been repaired will continue. In those cases where an imminent threat of loss of life exists from an unsafe dam, Ecology is authorized to take emergency action and eliminate or mitigate the hazard, charging the costs back to the owner. In the remaining cases where the deficiencies are serious but do not represent an imminent threat, it is up to the owners to come up with funding to complete the repairs. It should be noted that legislation has been introduced in Congress to create a federal loan fund for repairing the nation's unsafe publicly-owned dams. However, no funding programs are on the horizon as yet for privately owned dams.

To date, safety deficiencies have now been identified on a cumulative 179 dams, and actions to correct deficiencies are summarized below.

- .... Deficiencies have been corrected 151 dams.
- .... Partial repairs have been completed 6 dams.
- .... Engineering studies and/or design work is underway 8 dams.

The number of dams where owners have been unresponsive increased in 2004 from 13 to 14 projects, continuing a trend noted in the 2004 report. Owners are unresponsive due to lack of funding for repairs. These projects are still on a prioritized schedule for compliance. Should the owners continue to be unresponsive, the Ecology's Dam Safety Office will begin issuing regulatory orders and/or penalties. If an emergency situation exists, Ecology may physically reduce the hazard and charge the owner for costs incurred.



## Appendix A - Project Status

The status of the remaining projects with uncorrected deficiencies as identified during the Ecology inspections prior to 2005 is provided in Table I. The dams identified as having deficiencies in 2005 and 2006 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 2004 have been removed from this report. For a listing of these projects, please refer to the 2004 Report to the Legislature.



**TABLE I: PROJECT REHABILITATION STATUS SUMMARY OVER LAST 3 YEARS**  
(DAMS INSPECTED PRIOR TO 2005)

| County I.D #        | Project Name                         | Owner                                   | Safety Deficiencies           | Status Attitude |      |      | Estimated Repair Cost \$ Thousands | Repairs Completed | Population at Risk |
|---------------------|--------------------------------------|---|-------------------------------|-----------------|------|------|------------------------------------|-------------------|--------------------|
|                     |                                      |   |                               | 2004            | 2005 | 2006 |                                    |                   |                    |
| <b>BENTON</b>       | Blair Reservoir Dam                  | Kennewick Irrigation District           | Inadequate Spillway           | A,P             | P    | S    | 50-100                             | None              | 30-50              |
| <b>CHELAN</b>       | Great Depression Reservoir Dam       | Lappin Forest LLC                       | Inadequate Spillway Capacity  | A,P             | S    | S    | 5-10                               | None              | 10-15              |
| 72                  | Meadow Lake Dam                      | Galler Ditch Co.                        | Inadequate Spillway Capacity  | S               | S    | S    | 10-20                              | None              | 7-15               |
| 235, 412            | Wenatchee Heights Dam 1 & Saddle Dam | Wenatchee Heights Reclamation District. | Embankment Stability, Seepage | P, A            | C    | C    | 10-70                              | Completed         | 6-12               |
| <b>CLARK</b>        | Esteb Reservoir Dam                  | Orville Esteb                           | Inadequate Spillway Capacity  | A,S             | C    | C    | 10-30                              | Completed         | 1-3                |
| <b>FERRY</b>        | Grouden Dam                          | U.S Forest Service                      | Inadequate Spillway Capacity  | P               | P    | S    | 100-200                            | None              | 6-12               |
| <b>GRAYS HARBOR</b> | College Hill Reservoir               | City of Hoquiam                         | Seismic Stability Issues      | S               | S    | S    | 50-100                             | None              | 50-100             |
| <b>ISLAND</b>       | Minckler Dam B                       | Sherwood Minckler                       | Embankment Stability          | A,P             | S    | S    | 20-50                              | None              | 10-15              |

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

|                                |                                  |  |   |      |      |      |        |           |        |
|--------------------------------|----------------------------------|--|---|------|------|------|--------|-----------|--------|
| <b>KING</b><br>194             | Welcome Lake Dam                 | Lake of the Woods Homeowners               | Inadequate Spillway Capacity                            | A, P | P    | C    | 50     | Completed | 50-100 |
| <b>KLICKITAT</b><br>446        | Johnson Creek Res.               | Jim Meduna                                 | Spillway Erosion  | P    | S    | S    | 20-30  | None      | 1-3    |
| <b>OKANOGAN</b><br>662         | Aspen Lake Dam                   | Washington State Dept of Fish and Wildlife | Inadequate Spillway Embankment Stability                | P    | C    | C    | 50-100 | Completed | 3-6    |
| 40                             | Fanchers Dam                     | Cascade Ranches, Inc. Olma Brothers Corp.  | Inadequate Spillway Cap., Embankment Stability, Seepage | P, I | P, I | C    | 100    | Completed | 15-20  |
| 329                            | Beth Lake Dam                    | USDA National Forest                       | Inadequate Spillway Capacity                            | P    | P    | C    | 20-40  | Completed | 6-10   |
| <b>PACIFIC</b><br>522          | Indian Creek Dam                 | City of Ilwaco                             | Inadequate Freeboard                                    | P, I | P, I | P, I | 20     | Partial   | 1-3    |
| <b>SAN JUAN</b><br>486         | Buck Mountain Reservoir Dam 2    | Eastsound Water Users                      | Deteriorated Outlet Conduit                             | A, P | P    | P    | 50-100 | None      | 3-10   |
| 444                            | Roache Harbor Dam                | Roache Harbor Water Co.                    | Inadequate Spillway Capacity                            | P    | P    | P    | 100    | None      | 3-10   |
| <b>SKAGIT</b><br>382, 383, 384 | Cultus Mountain Dams A, B, and C | Evergreen Council, Boy Scouts of America   | Spillway Rehabilitation, Seismic Stability              | S    | A, S | S    | 10-70  | None      | 3-10   |
| 141                            | Nookachanps Hills Dam            | MV Association                             | Inadequate Spillway Cap., Embankment Stability          | S, I | S, I | S, I | 30-50  | Partial   | 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

| County I.D #                   | Project Name              | Owner                                  | Safety Deficiencies                                   | Status Attitude |         |      | Estimated Repair Cost \$ Thousands | Repairs Completed | Population at Risk |
|--------------------------------|---------------------------|--|---|-----------------|---------|------|------------------------------------|-------------------|--------------------|
|                                |                           |  |   | 2004            | 2005    | 2006 |                                    |                   |                    |
| <b>SNOHOMISH</b><br>1521, 1522 | Neilson Dams B & C        | Green Acres Mobile Home Park           | Inadequate Spillway Capacity                          | P               | S       | S    | 10                                 | None              | 7-10               |
|                                | Reflection Lake South Dam | Reflection Lake Homeowners Association | Inadequate Spillway Support, Maintenance Deficiencies | P               | P       | C    | 10                                 | Completed         | 8-12               |
| <b>SPOKANE</b><br>50           | Blue Gulch Reservoir      | Richard Hurst                          | Barrier Stability                                     | S, I            | C       | C    | 20                                 | Completed         | 1-3                |
|                                | Beitey Lake Dam           | Gerald Beitey                          | Inadequate Spillway                                   | S               | S, R, L | P, L | 30                                 | None              | 10-20              |
| <b>STEVENS</b><br>1308         | Serenity Lake Dam         | Long Wood LLC                          | Inadequate Spillway Capacity                          | S               | P       | C    | 10-15                              | Completed         | 10-20              |
| <b>THURSTON</b>                | Berger Dam                | Robert Strawn & Jeffrey Wong           | Inadequate Spillway Capacity                          | P               | P       | P, I | 15-25                              | Partial           | 1-3                |
|                                | Bagley Dam                | U.S. Forest Service Mt. Baker District | Concrete Deterioration                                | P               | P       | S    | 10-100                             | None              | 1-3                |
| <b>WHATCOM</b><br>1719         | Berghoff Dam              | Dwight Berghoff                        | Inadequate Spillway Capacity                          | S, I            | S, I    | P, I | 20-30                              | Partial           | 1-3                |
|                                | Stevenson Dam             | Robert White                           | Inadequate Spillway Capacity                          | A, S            | P, I    | P, I | 20-50                              | Partial           | 3-6                |
| <b>YAKIMA</b><br>1809          |                           |  |   |                 |         |      |                                    |                   |                    |
| 1010                           |                           |  |   |                 |         |      |                                    |                   |                    |

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 2005 & 2006 AND FOUND TO HAVE DEFICIENCIES)

| County I.D #               | Project Name           | Owner                              | Safety Deficiencies                       | Status/Attitude |      | Estimated Repair Cost \$ Thousands | Repairs Completed | Population at Risk    |
|----------------------------|------------------------|------------------------------------|---|-----------------|------|------------------------------------|-------------------|-----------------------|
|                            |                        |                                    |   | 2006            |      |                                    |                   |                       |
| <b>CHELAN</b><br>230       | Clear Lake Dam         | Stemilt Irrigation District        | Embankment Seepage                        | C               | C    | 60-100                             | Completed         | 10-15                 |
| <b>GRAYS HARBOR</b><br>547 | Swano Lake Dam         | Grays Harbor College               | Spillway Pipe Deterioration               | A, P            | A, P | 50-100                             | None              | 1-3                   |
| <b>KING</b><br>255         | Masonry Dam            | Seattle City Light                 | Cedar Moraine Stability                   | A, P            | A, P | 3,000                              | None              | 1-10                  |
| <b>KITSAP</b><br>704       | Ludvick Lake Dam       | Mr. & Mrs Jon Wilson               | Inadequate Spillway, Embankment Stability | A, P            | A, P | 50                                 | None              | 1-3                   |
| <b>OKANOGAN</b><br>220     | Forde Lake Dam         | WA Department of Fish and Wildlife | Spillway Erosion                          | P, I            | P, I | 100                                | Partial           | 10-30                 |
| <b>PACIFIC</b><br>366      | Dohman Creek Reservoir | City of Long Beach                 | Spillway Pipe Collapse                    | C               | C    | 800                                | Completed         | Water Supply for City |
| <b>PIERCE</b><br>366       | Lake Tapps Dike No. 15 | Puget Sound Energy                 | Seismic Stability of Embankment           | A, P            | A, P | 1,000                              | None              | 10-30                 |
| <b>SNOHOMISH</b><br>205    | Rainbow Springs Dam    | Rainbow Springs Community Club     | Outlet Pipe Deterioration                 | A, P            | A, P | 15-25                              | None              | 10-20                 |

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