
LOOKINGGLASS HATCHERY

A COMPILATION AND SUMMARY OF
IHOT AUDITS FOR SPRING CHINOOK
(GRANDE RONDE AND IMNAHA)

JULY 1998

**HATCHERY EVALUATION REPORT
SUMMARY FOR**

- Lookingglass Hatchery**
- **Spring Chinook (Grande Ronde Stock)**
- **Spring Chinook (Imnaha Stock)**

**A Summarized Compilation of Independent Audits Based on
Integrated Hatchery Operations Team (IHOT) Performance
Measures**

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CONTENTS

| | |
|---|----|
| Section 1 Executive Summary..... | 1 |
| Section 2 Facility Description | 4 |
| Section 3 Remedial Actions | 6 |
| Section 4 Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries | 11 |
| Section 5 Annual Operating Expenditures | 13 |

Section 1

Executive Summary

This report compiles a summary of the findings of two separate Hatchery Evaluation Reports for Spring Chinook (Grand Ronde and Imnaha Stock) at Lookingglass Hatchery. The original Hatchery Evaluation Reports, prepared by Montgomery Watson, presented each species and program separately and include the complete findings. Details on the audit compliance status for each species and program are included in the original reports. The Hatchery Evaluation Reports were based upon audits conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

The hatchery is located along Lookingglass Creek, a tributary of the Grande Ronde River, 2 miles from Palmer Junction in northeast Oregon. The hatchery is operated by the Oregon Department of Fish and Wildlife and used for adult collection, incubation, and rearing of spring chinook salmon.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) “Strategy for Salmon” and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the

Integrated Hatchery Operations Team (IHOT) in January 1995. IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*, which document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Lookingglass Hatchery - Spring Chinook (Grande Ronde and Innaha Stock) Results

The Lookingglass facility includes one pond for adult holding, 32 Canadian troughs for early rearing, and 18 concrete raceways. The Innaha Satellite Facility is operated as an adult collection and acclimation facility for the Innaha Spring Chinook Stock. The hatchery was constructed in 1982 to mitigate for fish losses caused by construction of hydroelectric facilities on the lower Snake River.

SPRING CHINOOK (GRANDE RONDE STOCK)

The Lookingglass Hatchery was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal. The audit found that the hatchery was not in compliance with the screen mesh opening criteria, adult holding facilities, temperature criteria, water quality monitoring criteria, and disease-free water criteria, which are all facilities requirements. If the current and captive broodstock program are continued, the hatchery will need more incubators, early rearing troughs, and outdoor raceways. The hatchery exceeds its loading for rearing and needs to develop specific standards for incubation and rearing for the IHOT operations plan. The hatchery was in compliance with all the genetics performance measures.

The specific areas in which the Lookingglass Hatchery - Spring Chinook (Grande Ronde Stock) program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Develop green-egg to eyed-egg survival goal
- Develop eyed-egg to fry survival goal
- Review temperature criteria for rearing; consider drilling additional wells
- Monitor DO and TGP
- Run analysis for chemistry parameters
- Run analysis for turbidity
- Run analysis for alkalinity and hardness
- Run analysis for nitrite
- Run analysis for contaminants
- Construct ozone system for influent and effluent disinfection (45 cfs)
- Check “other alarms” on a weekly basis
- Construct aeration system for adult holding
- Unclog smolt by-pass system
- Conduct IHOT feed QA/QC tests
- Develop specific incubation standards for IHOT
- Develop specific rearing and early rearing standards for IHOT
- Reduce loading of raceways
- Develop smoltification monitoring program and goals
- Follow IHOT transportation protocols
- Change traveling screens to 3/32”
- Construct 6 more raceways (needed if current and captive brood programs are retained)
- Install 11 additional Canadian troughs; enlarge building (needed if current and captive brood programs are retained)
- Install 288 additional tray incubator and replumb incubation piping (needed if current and captive brood programs are retained)
- Construct stripping tower to treat 2,000 gpm

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery were not listed above.

SPRING CHINOOK (IMNAHA STOCK)

The Lookingglass Hatchery was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal. The audit found that the hatchery was not in compliance with the screen mesh opening criteria, adult holding facilities, temperature criteria, water quality monitoring criteria, and disease-free water criteria, which are all facilities requirements. If the current and captive broodstock program are continued,

the hatchery will need more incubators, early rearing troughs, and outdoor raceways. The hatchery exceeds its density and loading criteria for early rearing (when using the criteria for rearing) and needs to develop specific standards for incubation, early rearing, and rearing for the IHOT operations plan. The hatchery was in compliance with all the genetics performance measures.

The specific areas in which the Lookingglass Hatchery Spring Chinook (Imnaha Stock) program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Change traveling screens to 3/32"
- Check "other alarms" on a weekly basis
- Conduct IHOT feed QA/QC tests
- Construct 6 more raceways (needed if current and captive brood programs are retained)
- Construct aeration system for adult holding
- Construct ozone system for influent and effluent disinfection (45 cfs)
- Construct stripping tower to treat 2,000 gpm
- Develop eyed-egg to fry survival goal
- Develop green-egg to eyed-egg survival goal
- Develop smoltification monitoring program and goals
- Develop specific incubation standards for IHOT
- Develop specific rearing and early rearing standards for IHOT
- Double screen 9 raceways
- Follow IHOT transportation protocols
- Install 11 additional Canadian troughs; enlarge building (needed if current and captive brood programs are retained)
- Install 288 additional tray incubator and replumb incubation piping (needed if current and captive brood programs are retained)
- Monitor DO and TGP
- Review temperature criteria for rearing; consider drilling additional wells
- Run analysis for alkalinity and hardness
- Run analysis for chemistry parameters
- Run analysis for contaminants
- Run analysis for nitrite
- Run analysis for turbidity
- Unclog smolt by-pass system

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery were not listed above

Facility Description

| | |
|--------------------------|--|
| Name: | Lookingglass Hatchery |
| Stock/Species: | Spring Chinook, Grande Ronde Stock Spring Chinook, Imnaha Stock |
| Operating Agency: | Oregon Department of Fish & Wildlife |
| Funding Agency: | Lower Snake River Compensation Program |
| Location: | Along Lookingglass Creek, a tributary of the Grande Ronde River, 2 miles from Palmer Junction in northeast Oregon |
| Address: | Lookingglass Fish Hatchery 76657 Lookingglass Road Elgin, OR 97827 |
| Hatchery Manager: | Mr. Robert Lund |
| Phone: | (541) 437-9723 |
| Fax: | (541) 437-1919 |
| Purpose: | Lookingglass Hatchery was constructed in 1982 as part of the Lower Snake River Compensation Program (LSRCP) - a program to mitigate for spring chinook and summer steelhead losses caused by the four federal dams constructed on the lower Snake River. Lookingglass is used to raise spring chinook for ocean and river fisheries. |
| Production Goal: | Chinook Salmon (Grande Ronde Stock) 900,000 smolts (48,335 lb) for on-station release Chinook Salmon (Imnaha Stock) 490,000 smolts (19,470 lb) for release from the Imnaha Acclimation pond |
| Water Supply: | Water rights for the hatchery total 38,782 gpm from Lookingglass Creek and wells. Water rights for Lookingglass Creek include 22,442 gpm for fish propagation an additional 13,462 for operation of a fishway. |

Facilities:

| | |
|-----------------------|---|
| Adult Holding: | 1 concrete holding pond - 6400 cf |
| Incubation: | 36 8-tray vertical stacks (252 trays useable) |
| Early Rearing: | 32 Canadian troughs - 60 cf each |
| Raceways: | 18 concrete raceways - 3,500 cf each |
| Rearing Ponds: | None |
| Satellite Facilities: | Imnaha Acclimation Pond (Gumboot Weir) |

Section 3
Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

| Type | Description |
|------|--|
| 1 | Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery |
| 2 | Remedial actions requiring changes in agency policies or procedures |
| 3 | Remedial actions requiring changes in monitoring coverage or interval |
| 4 | Remedial actions requiring significant capital expenditures |
| 5 | Remedial actions that may require significant capital expenditures but are not clearly definable at this time |

Remedial Actions at Lookingglass Hatchery - Spring Chinook (Grande Ronde and Imnaha Stocks)

This section presents the corrective actions required to bring Lookingglass Hatchery - Spring Chinook (Grande Ronde and Imnaha Stocks) programs into compliance with the IHOT performance measures. The remedial actions described here are suggestions developed by the Montgomery Watson Audit Team. The remedial actions and associated cost estimate have not been analyzed or prioritized by the respective operating agencies, fishing managers, or IHOT. There may be additional remedial actions, not included in this report, proposed by the respective, proposed by the respective operating agencies. The remedial actions and associated cost estimates have not been analyzed or prioritized by the respective operating agencies, fishery managers, or IHOT. There may be additional remedial actions, not included in this report, proposed by the respective operating agencies. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Tables 3a and 3b).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ($\pm 40\%$).

The suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3a. Remedial Actions Required at Lookingglass Hatchery - Spring Chinook (Grande Ronde Stock)

| Remedial Action Required | Cost | PMs ¹ |
|--|---|---|
| <p>Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery</p> <p>Need better adult survival</p> | ---- | 22a4 |
| <p>Type 2 - Remedial actions requiring changes in agency policies or procedures</p> <p>Develop green-egg to eyed-egg survival goal</p> <p>Develop eyed-egg to fry survival goal</p> <p>Develop specific incubation standards for IHOT</p> <p>Incubation flows less than IHOT criteria; not a problem due to reduced loading</p> <p>Develop specific rearing and early rearing standards for IHOT</p> <p>Reduce loading of raceways</p> <p>Develop smoltification monitoring program and goals</p> <p>Follow IHOT transportation protocols</p> | <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> | <p>4d</p> <p>4e</p> <p>18</p> <p>18</p> <p>19</p> <p>19</p> <p>22a1</p> <p>23</p> |
| <p>Type 3 - Remedial actions requiring changes in monitoring coverage or interval</p> <p>Monitor DO and TGP</p> <p>Run analysis for chemistry parameters</p> <p>Run analysis for turbidity</p> <p>Run analysis for alkalinity and hardness</p> <p>Run analysis for nitrite</p> <p>Run analysis for contaminants</p> <p>Check “other alarms” on a weekly basis</p> <p>Conduct IHOT feed QA/QC tests</p> | <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> | <p>5b</p> <p>5c</p> <p>5d</p> <p>5e</p> <p>5f</p> <p>5g</p> <p>6</p> <p>12</p> |

¹ PMs are performance measures that were extracted from the IHOT 1995 report.

| Remedial Action Required | Cost | PMs ¹ |
|--|---------------------|-------------------------|
| Type 4 - Remedial actions requiring significant capital expenditures | | |
| Construct stripping tower to treat 2,000 gpm | \$5,000 | 5b |
| Construct aeration system for adult holding | \$5,000 to \$10,000 | 4b, 4c, 4g, 4h, 7, 22a4 |
| Install 288 additional tray incubator and replumb incubation piping (needed if current and captive brood programs are retained) | \$32,500 | 8 |
| Install 11 additional Canadian troughs; enlarge building (needed if current and captive brood programs are retained) | \$250,000 | 9 |
| Construct 6 more raceways (needed if current and captive brood programs are retained) | \$500,000 | 9 |
| Unclog smolt by-pass system | \$5,000 to \$10,000 | 10 |
| Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time | | |
| Review temperature criteria for rearing; consider drilling additional wells | ---- | 5a |
| Construct ozone system for influent and effluent disinfection (45 cfs) | ---- | 5h,28 |
| Change traveling screens to 3/32" | ---- | 10 |

Table 3b. Remedial Actions Required at Lookingglass Hatchery - Spring Chinook (Imnaha Stock)

| Remedial Action Required | Cost | PMs ¹ |
|--------------------------|------|------------------|
|--------------------------|------|------------------|

¹ PMs are performance measures that were extracted from the IHOT 1995 report.

¹ PMs are performance measures that were extracted from the IHOT 1995 report.

| Remedial Action Required | Cost | PMS ¹ |
|---|---|---|
| <p>Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery</p> <p>Need better adult survival</p> | ---- | 22a4 |
| <p>Type 2 - Remedial actions requiring changes in agency policies or procedures</p> <p>Develop green-egg to eyed egg survival goal</p> <p>Develop eyed-egg to fry survival goal</p> <p>Develop specific incubation standards for IHOT</p> <p>Incubation flows less than IHOT criteria; not a problem due to reduced loading</p> <p>Develop specific rearing and early rearing standards for IHOT</p> <p>Not in compliance with rearing density and loading criteria when applied to early rearing</p> <p>Develop smoltification monitoring program and goals</p> <p>Follow IHOT transportation protocols</p> | <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> | <p>4d</p> <p>4e</p> <p>18</p> <p>18</p> <p>19</p> <p>19</p> <p>22a1</p> <p>23</p> |
| <p>Type 3 - Remedial actions requiring changes in monitoring coverage or interval</p> <p>Monitor DO and TGP</p> <p>Run analysis for chemistry parameters</p> <p>Run analysis for turbidity</p> <p>Run analysis for alkalinity and hardness</p> <p>Run analysis for nitrite</p> <p>Run analysis for contaminants</p> <p>Check "other alarms" on a weekly basis</p> <p>Conduct IHOT feed QA/QC tests</p> | <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> <p>----</p> | <p>5b</p> <p>5c</p> <p>5d</p> <p>5e</p> <p>5f</p> <p>5g</p> <p>6</p> <p>12</p> |

| Remedial Action Required | Cost | PMS ¹ |
|--|---------------------|-------------------------|
| Type 4 - Remedial actions requiring significant capital expenditures | | |
| Construct stripping tower to treat 2,000 gpm | \$5,000 | 5b |
| Construct aeration system for adult holding | \$5,000 to \$10,000 | 4b, 4c, 4g, 4h, 7, 22a4 |
| Install 288 additional tray incubator and replumb incubation piping (needed if current and captive brood programs are retained) | \$32,500 | 8 |
| Install 11 additional Canadian troughs; enlarge building (needed if current and captive brood programs are retained) | \$250,000 | 9 |
| Construct 6 more raceways (needed if current and captive brood programs are retained) | \$500,000 | 9 |
| Unclog smolt by-pass system | \$5,000 to \$10,000 | 10 |
| Double screen 9 raceways | \$6,000 | 10 |
| Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time | | |
| Review temperature criteria for rearing; consider drilling additional wells | --- | 5a |
| Construct ozone system for influent and effluent disinfection (45 cfs) | --- | 5h,28 |
| Change traveling screens to 3/32" | --- | 10 |

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Lookingglass Hatchery - Spring Chinook (Grande Ronde and Imnaha Stocks) programs contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries (Tables 4a and 4b). Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

Table 4a. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries: Lookingglass Hatchery - Spring Chinook (Grande Ronde Stock)

| Year | Fisheries ¹ (Broodyear) | Spawning Grounds ¹ (Broodyear) | Hatchery ¹ (Broodyear) | Total Combined Contribution ¹ (Broodyear) | Smolt to Adult Survival (percent) |
|------|---------------------------------------|--|--------------------------------------|---|--------------------------------------|
| 1981 | | | | | |
| 1982 | | | | | |
| 1983 | | | | | |
| 1984 | | | | 52 | 0.11 |
| 1985 | | | | 480 | 0.052 |
| 1986 | | | | 406 | 0.092 |
| 1987 | | | | 144 | 0.040 |
| 1988 | | | | 2355 | 0.38 |
| 1989 | | | | | |
| 1990 | | | | | |
| 1991 | | | | | |
| 1992 | | | | | |

¹ Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

¹ Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

**Table 4b. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Lookingglass Hatchery - Spring Chinook (Imnaha Stock)**

| Year | Fisheries¹ (Broodyear) | Spawning Grounds¹ (Broodyear) | Hatchery¹ (Broodyear) | Total Combined Contribution² (Broodyear) | Smolt to Adult Survival (percent) |
|-------------|--|---|---|--|--|
| 1981 | | | | | |
| 1982 | | | | 27 | 0.11 |
| 1983 | | | | 46 | 0.04 |
| 1984 | | | | 86 | 0.25 |
| 1985 | | | | 133 | 0.13 |
| 1986 | | | | 317 | 0.17 |
| 1987 | | | | 208 | 0.15 |
| 1988 | | | | 790 | 0.37 |
| 1989 | | | | 185 | 0.11 |
| 1990 | | | | | |
| 1991 | | | | | |
| 1992 | | | | | |

¹ Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

² Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, and supplies), capital costs, indirect costs charged to the Federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. The total expenditures for the Lookingglass Hatchery are presented in Table 5 by program. The detailed breakdown of program expenditures for spring chinook at this hatchery is presented in separate tables (Table 6a and 6b).

Table 5. Annual Operating Expenses - Lookingglass Hatchery

| Program | 1994 | 1995 | 1996 |
|--|------------------|------------------|------------------|
| 1. Chinook Salmon (Grande Ronde Stock) | \$643,873 | \$339,434 | \$250,198 |
| 2. Chinook Salmon (Imnaha Stock) | \$127,232 | \$339,434 | \$250,198 |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Total Hatchery Costs | \$771,105 | \$678,868 | \$500,396 |

**Table 6a. Detailed Expenditures at Lookingglass Hatchery by Program
Spring Chinook, Grande Ronde Stock**

| Component | 1994 | 1995 | 1996 |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs | \$231,924 | \$206,448 | \$191,769 |
| Operational Costs | \$362,215 | \$341,093 | \$222,807 |
| Capital Costs | \$60,214 | \$20,577 | \$0 |
| Indirect Costs | \$116,752 | \$110,750 | \$86,320 |
| Lumped Hatchery Costs ¹ | | | |
| Lumped Third-Party Costs | \$0 | \$0 | \$0 |
| Total Hatchery Costs | \$771,105 | \$678,868 | \$500,396 |
| Source of Funds | | | |
| | 100% | 100% | 100% |
| | | | |
| Program Production (lb) | 44,819 | 30,078 | 6,955 |
| Total Production (lb) | 53,014 | 36,576 | 11,897 |
| Program as Percent of Total | 83.5% | 50% | 50% |
| Program Costs | \$643,873 | \$339,434 | \$250,198 |

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6b. Detailed Expenditures at Lookingglass Hatchery by Program
Spring Chinook, Imnaha Stock**

| Component | 1994 | 1995 | 1996 |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs | \$231,924 | \$206,448 | \$191,769 |
| Operational Costs | \$362,215 | \$341,093 | \$222,807 |
| Capital Costs | \$60,214 | \$20,577 | \$0 |
| Indirect Costs | \$116,752 | \$110,750 | \$86,320 |
| Lumped Hatchery Costs ¹ | | | |
| Lumped Third-Party Costs | \$0 | \$0 | \$0 |
| Total Hatchery Costs | \$771,105 | \$678,868 | \$500,396 |
| Source of Funds | | | |
| | 100% | 100% | 100% |
| | | | |
| Program Production (lb) | 8,195 | 6,498 | 4,942 |
| Total Production (lb) | 53,014 | 36,576 | 11,897 |
| Program as Percent of Total | 16.5% | 50% | 50% |
| Program Costs | \$127,232 | \$339,434 | \$250,198 |

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¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.