Sea-run Hatcheries!

THE SITUATION IN SOUTH CANTERBURY.

McKinnons Creek Salmon Hatchery.

Waitaki Volunteer Salmon Hatchery.

WAITAKI RIVER SALMON HATCHERY.

Started 2009. Concern over fishery in the Waitaki.

Raised funds, enlisted help from the community
Problems getting a consent, ultimately very costly

Have many good sponsors and community support. Well funded.

Hatchery in early stages and limited data available.

Challenges.

Dydimo;

This pest has made the operation of the hatchery very labour intensive and in its micro form it would easily block the fish screens, which required the raceway to be cleaned every day. This lasts till the fish are big enough to remain behind a 10mm square mesh when the raceway could be left for 2 or three days depending on rate of river flow.

Changing River flows. Due to Hydro generation. It is not unusual for the river level to increase by 200 cumecs over several hours bringing down 1000s of tons of Dydimo. A rise of 150 cumec results in daily cleaning of screens.

Obtaining Broodstock.. This has been a problem holding hatchery back at present. Lack of returning adults over last few years. Ready to make a difference when suitable stock arrives.

At present the hatchery is operating over 2 sites, "Bells Ponds and Welcome stream".

McKinnon's Creek Salmon Hatchery

A project maintained by Volunteers

www.mckinnonscreek.co.nz

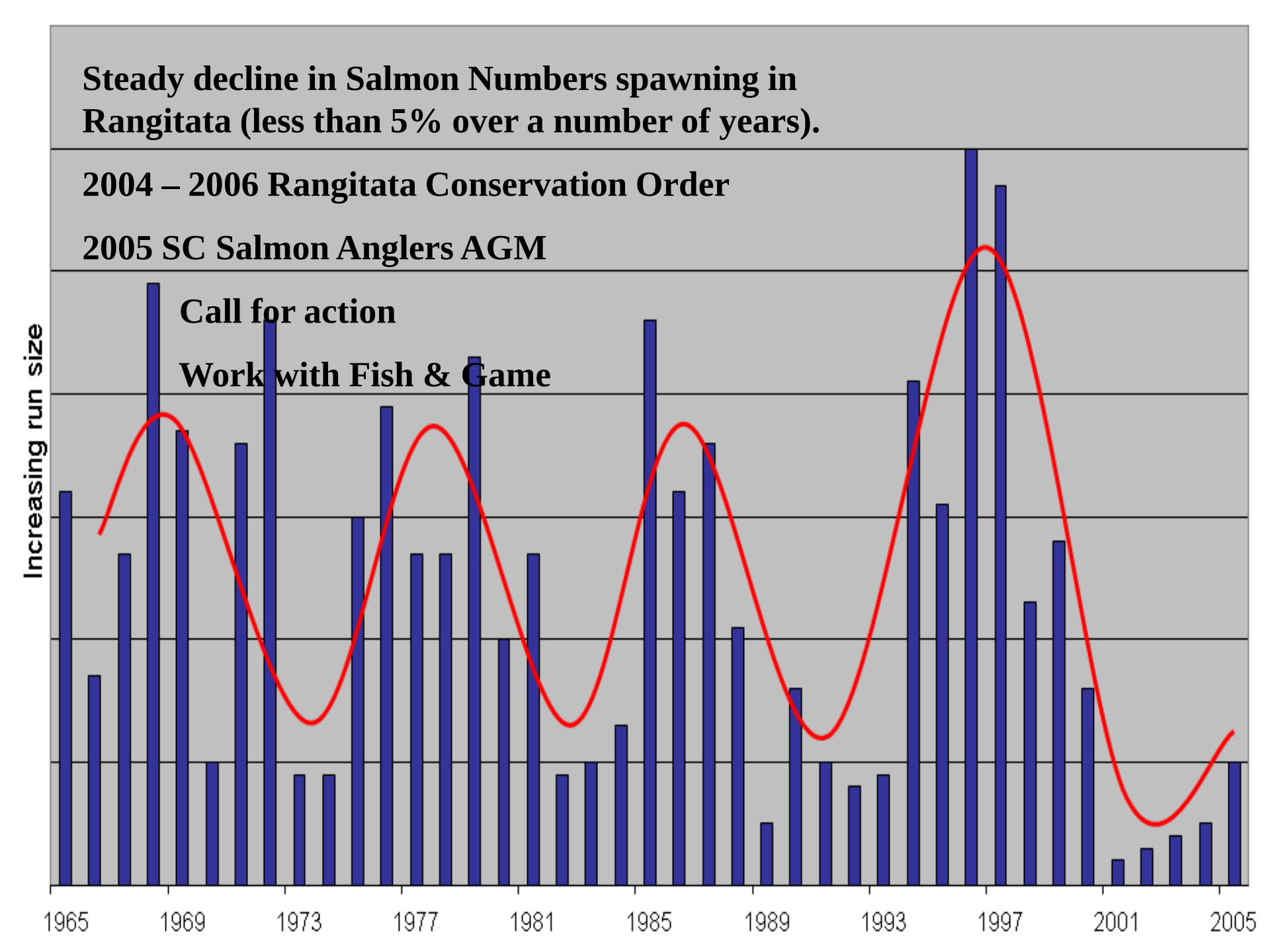
South Canterbury

Salmon Anglers.

Salmon & Riparian Support Trust. Inc

Fish & Game NEW ZEALAND


McKinnons Creek
Rangitata river


Steady decline in Salmon Numbers spawning in Rangitata (less than 5% over a number of years).
2004 – 2006 Rangitata Conservation Order
2005 SC Salmon Anglers AGM
Call for action
Work with Fish & Game
Increasing run size
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005

McKinnon's Creek

Flows into Rangitata River.

Met all requirements.
Spring fed stream Independent of main river.
Good flow of water.
Fish had previously spawned there.
Site of disused salmon farm.

What we found !

Resource Consents

Planning Consent

Change of Land Use

Water Take consent

Discharge consent

In Stream work consent

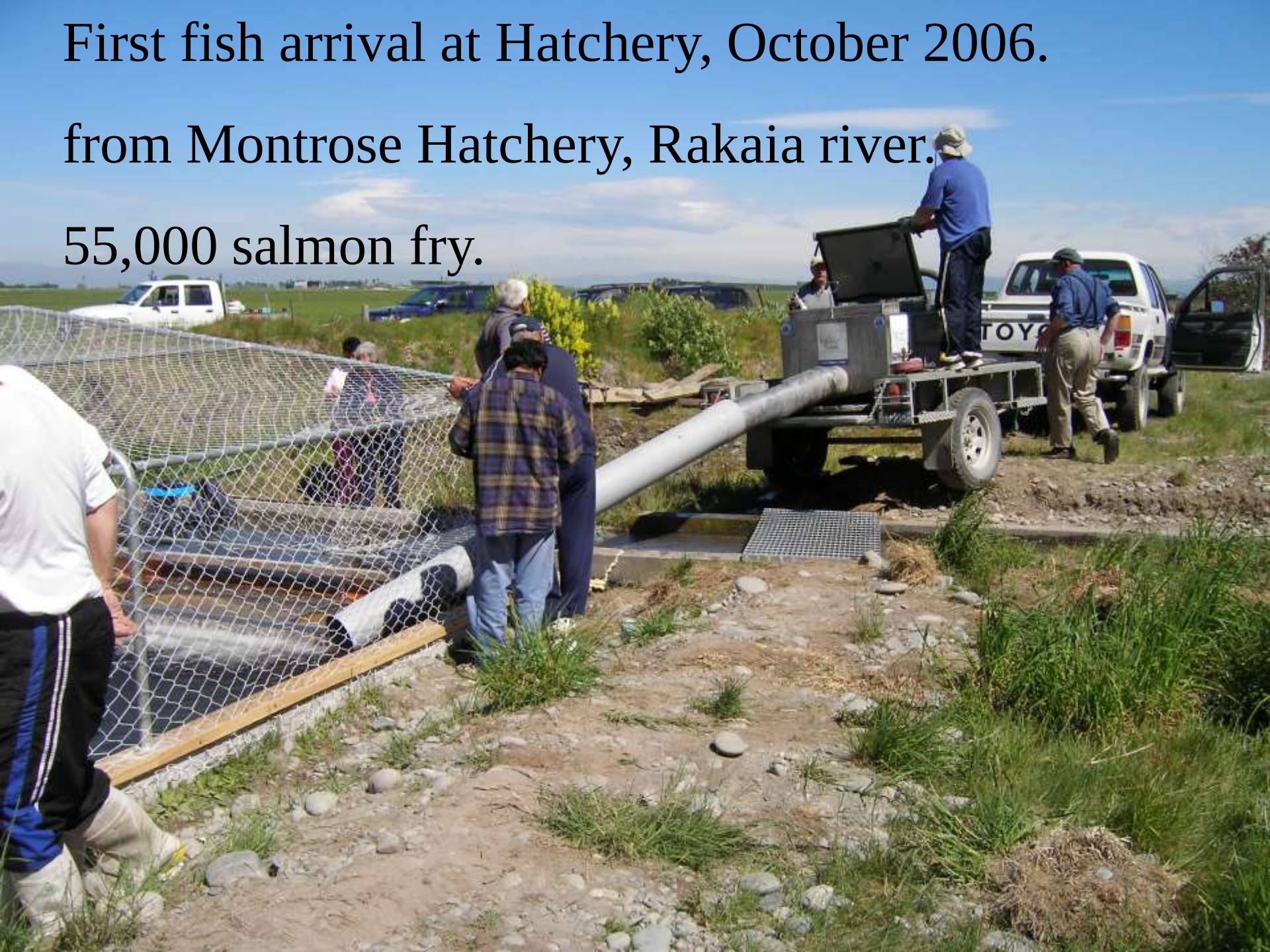
Discharge of contaminants and chemicals

Building permits

Consent to farm fish


June 2006
Advertised in Local Media.
Spread word to local anglers
and community groups.
1st Working bee
60 plus persons responded.
Site cleaned up and old hatchery
exposed
Obvious support from
Community.


Work went on all through the Winter weekends.


First fish arrival at Hatchery, October 2006.
from Montrose Hatchery, Rakaia river.
55,000 salmon fry.

Weekend teams of volunteers.

4 – 6 persons in each team.

Vacuum out raceways.

Clean screens.

Take readings.

Check on fish health.

Check automatic feeders


`Fin Clipping, March/April
each year, 20-30 persons help.
Scale sampling in future.
CANTERBURY

Annual release back into Rangitata river
July/August, falling hydrograph .

65 grams.


Milt from adult
male fish

Up to 7000 eggs per tray

Better incubation rate with eggs from 1 adult per tray (3,500 – 4000)


Transfer from shed to races Approx 5gms.


Black Mountain Stream.
Mesopotamia Station,
Rangitata river.


RSL Spawning Race.
Huge potential.

SOME VITAL STATISTICS!

Fish returned to hatchery since 2009: 4354

Hatchery reared fish caught on south side Rangitata since 2009: 3442. Av 382/season.

In the first 6 months of 2012 we released 199,000 smolt back into Rangitata river (below Arundel) These fish returned in the 2013 season in record numbers (960 Adults) with 442 caught on the South side.

Considerable stray factor to Orari river,

Decreasing returns over the past 2 years.

Last year only enough eggs for our 60,000 brood stock plus 13,000 at RSL spawning race and 8,000 for Opihi river.

Table 2. Brood year, year of release, age at return and overall return rate as a percentage of the total number of fin clipped and non-fin clipped juvenile salmon released from McKinnons Hatchery.

Brood year	Number released	Date of release	% fin clipped	No. return 1^+	No. return 2^+	No. return 3^+	Total return	Percent return
2006	55,000	July 07	100	0	1,254	203	1457	**2.64**
2007	72,000	July 08	100	22	433	89	544	**0.75**
2008	52,000	July 09	100	107	837	7	951	**1.82**
2009	65,000	July 10	100	349	1,072	8	1,429	**2.20**
2010	70,000	July 11	53.7	189	636	21	846	**1.21**
2011	95,000	July 12	47.4	36	1,400	5	1,441	**1.51**
2012	63,000	July 13	68.25	20	292	3	315	**0.5**
2013	64,000	June 14	50	5	132	12	149	**0.23**
2014	70,000	Feb/Jun15	50	25	84	2017/18	159+	
2015	60,000	Jun 16	60	20	2017/18	2018/19	80+	
2016	**60,000**	**May/Jul17**	**0**	**2017/18**	**2018/19**	**2019/20**		

. Number of wild and hatchery origin fin clipped and non fin clipped salmon returning to the Rangitata, Orari and Opihi rivers that were caught by anglers, or spawned in those rivers, or returned to McKinnons Hatchery for the 2008/09 to 2013/14 seasons. Eight hatchery origin salmon caught by anglers in the Ashburton River and five in the Waitaki have not been included.

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16		
Rangitata River										
Hatchery angler caught	241	67	241	237	69	294	150	76		
Hatchery spawned	39	2	33	42	61	18	24	15		
Returns to hatchery	650	389	774	731	408	344	64	37		
Total hatchery origin	930	458	1,048	1,010	538	656	238	128		
Wild angler caught	998	506	485	740	1,229	812	914	338		
Wild spawned	2,714	901	905	1,610	3,042	1,283	1,666	1,055		
Wild returns to hatchery	0	0	31	79	42	621	346	146		
Total wild	3,712	1,407	1,421	2,429	4,313	2,716	2,926	1539		
Orari River										
Hatchery angler caught	28	28	70	29	13	270	20	0		
Hatchery spawned	72	90	62	49	24	350	4	0		
Total hatchery	100	118	132	78	37	620	24	0		
Wild angler caught	27	32	23	177	94	371	86	15		
Wild spawned	48	60	41	51	176	150	12	15		
Total wild	75	92	64	228	270	521	98	30		
Opihi River										
Hatchery angler caught	221	137	63	104	13	142	10	8		
Hatchery spawned	25	30	32	27	9	23	30	24		
Total hatchery	246	167	95	131	22	165	40	32		
Wild angler caught	277	197	225	252	665	408	28	25		
Wild spawned	525	670	668	573	591	477	70	76		
Total wild	802	867	893	825	1,256	885	98	101		
All Rivers										
Fin clip angler caught	490	232	374	370	95	353	90	42		
Hatchery spawned	136	122	127	118	94	391	58	39		
Returns to hatchery	650	389	774	731	408	344	64	37		
Angler non fin clip catch	0	0	0	49	83	353	90	42		
Total hatchery	1,276	743	1,275	1,268	680	1,441	302	160		
Wild angler caught	1,302	735	733	1,169	1,988	1,591	1,028	378		
Wild spawned	3,287	1,631	1,614	2,234	3,809	1,910	1,748	1,146		
Wild returns to hatchery	0	0	31	79	42	621	346	146		
Total wild	4,589	2,366	2,378	3,482	5,839	4,122	3,122	1,670		

Future Challenges.

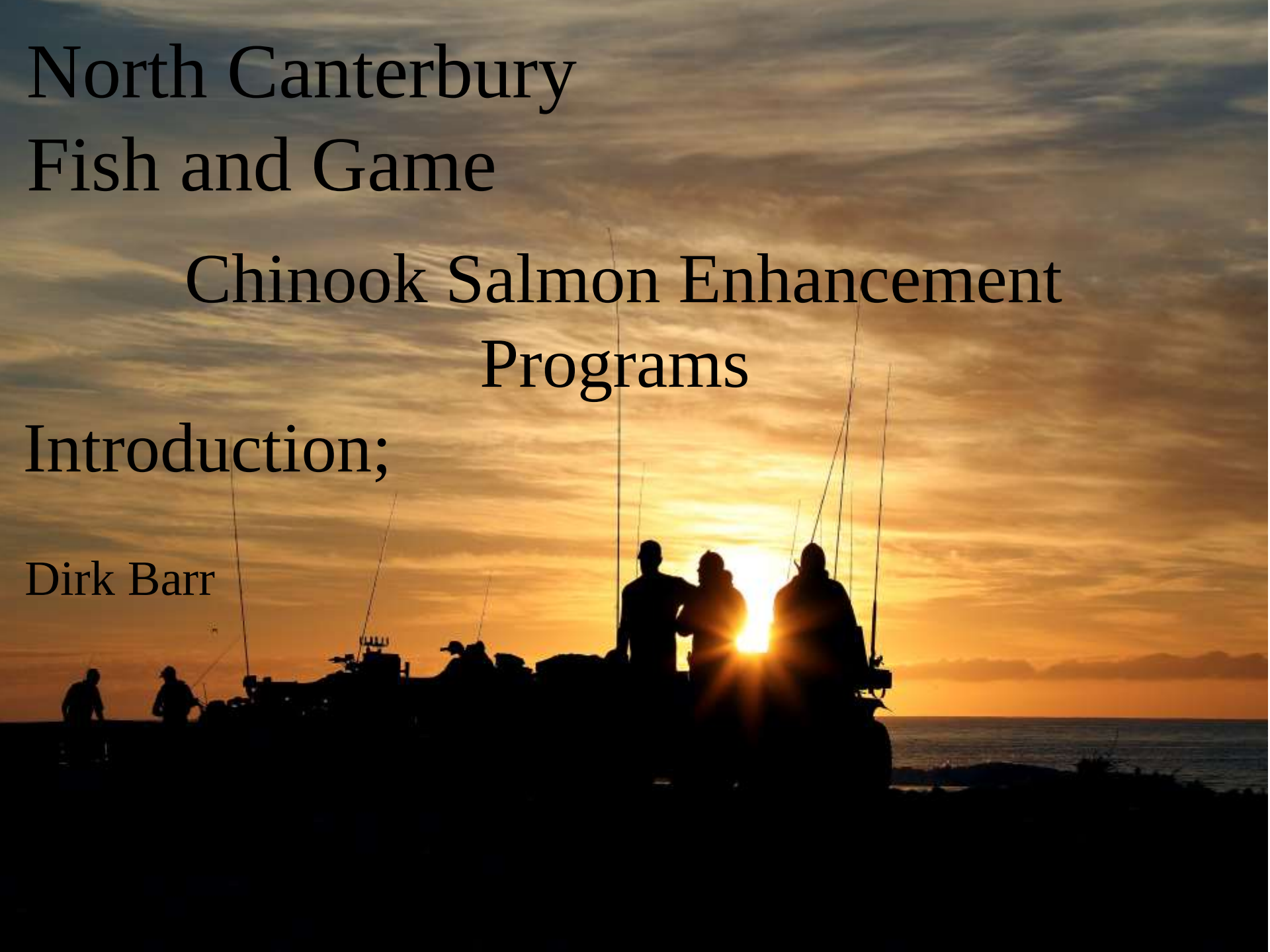
Returning fish challenge,
What will future returns be like.

Future of McKinnons creek
Increasing nutrient levels
Irrigation abstractions

Motivating Volunteers
Encouraging younger members.

Increasing cost of fish-food

FIN



North Canterbury Fish and Game

Chinook Salmon Enhancement Programs

Introduction;

Dirk Barr

North Canterbury Fish & Game

Salmon and Trout Enhancement Programs

Montrose Stream Salmon Hatchery Location.

- The Montrose Stream. Outflow into the Rakaia River 6 kms above the Gorge Bridge on the South Side.

- 60,000 Salmon Smolts released annually.

The Montrose Hatchery. A real fisheries asset.

- Pristine Quality Cold filtered water. 10 deg max summer temp.
- Salmon returning to a natural high country spawning stream.
- Slow smolt growth rates due to cold temperature.
- Ova harvest production percentages high.
- The furthest inland Hatchery location.

Whisky Creek

Chinook Salmon Smolt Releases. New Imprinting Site since 2017

2 derelict raceways rebuilt by volunteers in 2016.

Whisky Creek. Outflow into the Rakaia River appox 20 kms above the Gorge Bridge on the North Side. Rearing capacity 50,000 x 50 gram smolts.

Whisky Creek. The Historic First Release. July 2017

- After years of planning, 140 Lake Coleridge residents and station owners turn up to celebrate the first release.
- Stable flows during a 2 year drought.
- First 3 year old returns due back in April 2019.

A partnership with Trust Power results in 30,000 salmon smolts being imprinted for 6 months, and released into the Rakaia River.

Bully Creek

Chinook Salmon Smolt Releases. Lower Rakaia Imprinting Site since 2017

A series of spring creek ponds are being utilised for imprinting.

Bully Creek. Outflow into the Rakaia River, South Side Lagoon. Caretaker Johnny nurtures smolts in the main lake before Winter releases into the Creek.

The site is downstream of any irrigation fish screens.

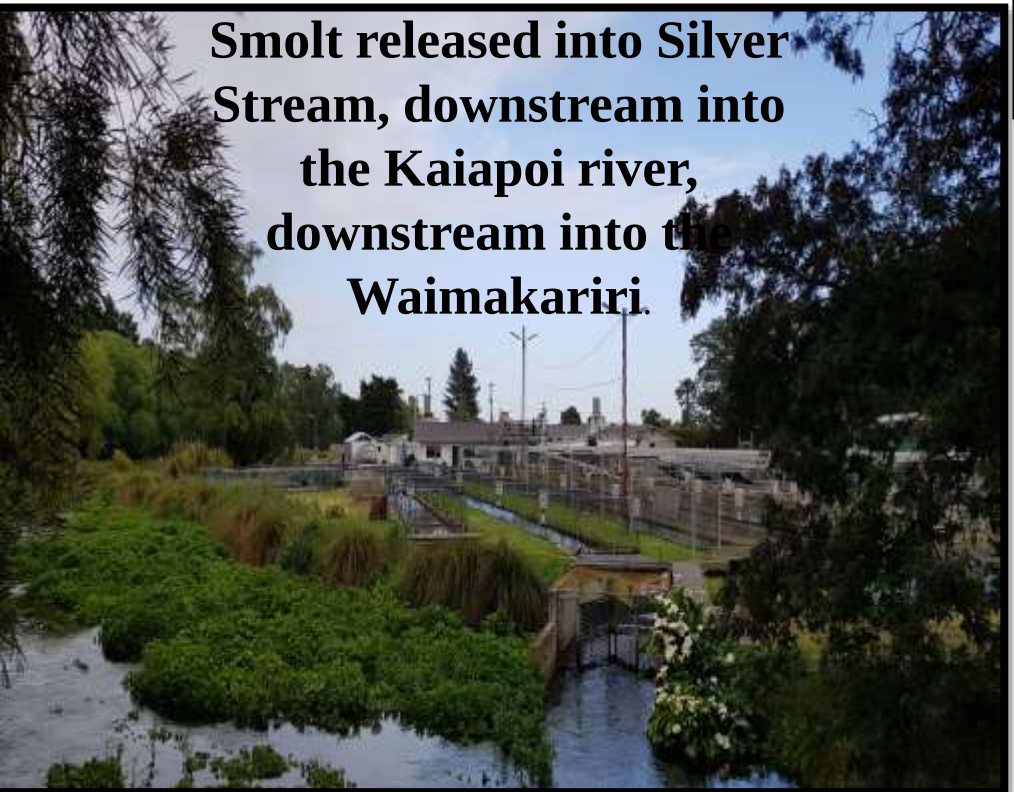
Bully Creek Smolt. A Lowland Chinook Initiative.

- Thanks to the generosity of a local landowner Fish and Game have taken on a new enhancement initiative.
- Sponsored by Rakaia River Fishing Promotions.
- 30,000 smolts released July 2017.

Rakaia Huts Holders actively involved in the project. More than 120 locals turn up to release the smolts from Lake Jacqulyn.

Silver Stream

Waimakariri River Chinook Salmon Enhancement Program



Smolt released into Silver Stream, downstream into the Kaiapoi river, downstream into the Waimakariri.

NC Fish and Game imprint 30,000 smolts Annually at the Silver Stream hatchery site.

This Salmon Enhancement Program is not only the longest running, it has historically supported the most successful salmon returns of all.

The Silver Stream Hatchery. Waimakariri River.

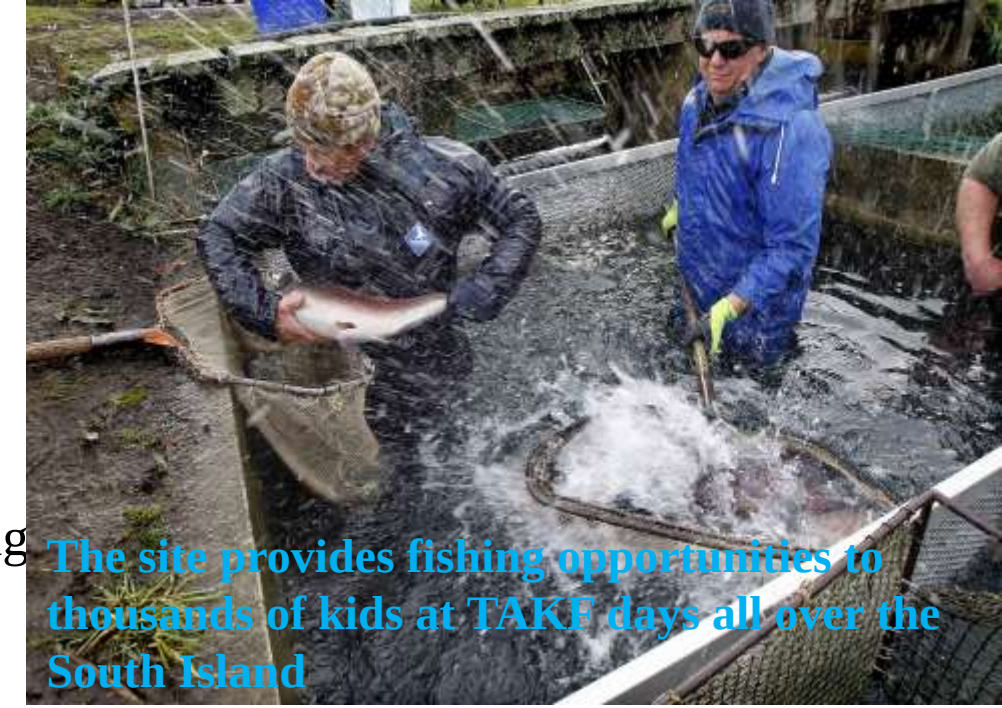
- NCF&G work along side the NZ Salmon Smolt Company, with a dedicated joint objective of providing anglers with successful salmon returns.
- Shared knowledge and help with in the industry.
- 30,000 smolts released Annually.

Karl French NZ Salmon Smolt Manager tending to stock at the Silver Stream Hatchery. Huge support is gifted to Fish and Game from the commercial sector annually. From monitoring adult trap returns, feeding Fish and Game smolt stocks, and donating insurance stocks for put and take fisheries.

Peacock Springs
Otukaikino River

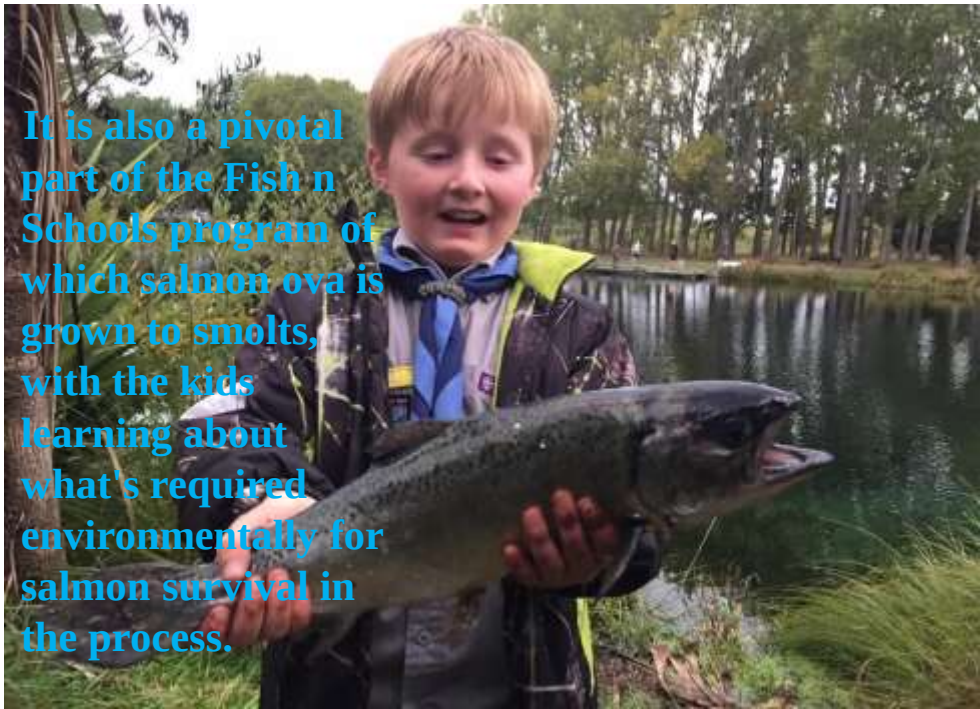
On Growing Facility
(Waimakariri Tributary)

Peacock Springs is primarily an on growing facility for the purpose of supplying kids fishing events. 3000 Salmon and Trout are grown to catchable sizes annually.



The site provides fishing opportunities to thousands of kids at TAKE days all over the South Island

Thanks to the generosity of Isaacs and their Wildlife Conservation Trust supporting for F&G with a very friendly lease arrangement.



It is also a pivotal part of the Fish n Schools program of which salmon ova is grown to smolts, with the kids learning about what's required environmentally for salmon survival in the process.

Eyed Ova Planting Programs

The Orange Gold Harvest

Organisations Planting Ova Annually

- The NZ Salmon Anglers Association.
- Rakaia River Fishing Promotions.
- North Rakaia Hut Holders.
- South Rakaia Hut Holders.

Ova Planting,

How our NZ Chinook fishery was first seeded.

- **Eyed ova planting has come a long way in the past 100 years from simply pouring eggs into stream bed and hoping most of them fall between the stones.**
- **First there was the barrel planting method which allowed a redd to be constructed sheltered from current. The ova was then deposited through the top of the open ended barrel, stones carefully placed inside simulating a natural red before removing the barrel.**
- **The barrel method was effective, but then came something better. The Jorden Scotty Boxes. Every egg has its own cell and incubates with out the infiltration of silt, the main killer of salmon ova in natural redds.**

Volunteers brave the winter months of June and July seeding many streams in our High and Low country

Ova Planting Schedules for Secondary Salmon Spawning Streams

Waimakariri Catchment

- **One Tree Swamp, 30,000**
- **Broken River, 10,000**
- **Porter River, 10,000**
- **Hacketts Creek, 20,000**

Rakaia Catchment

- **Double Hill Stream, 30,000**
- **East Branch Glenariffe, 20,000**
- **Koopmans Stream, 25,000**
- **Bully Creek, 10,000**
- **Cold Stream, 10,000**

Hurunui Catchment

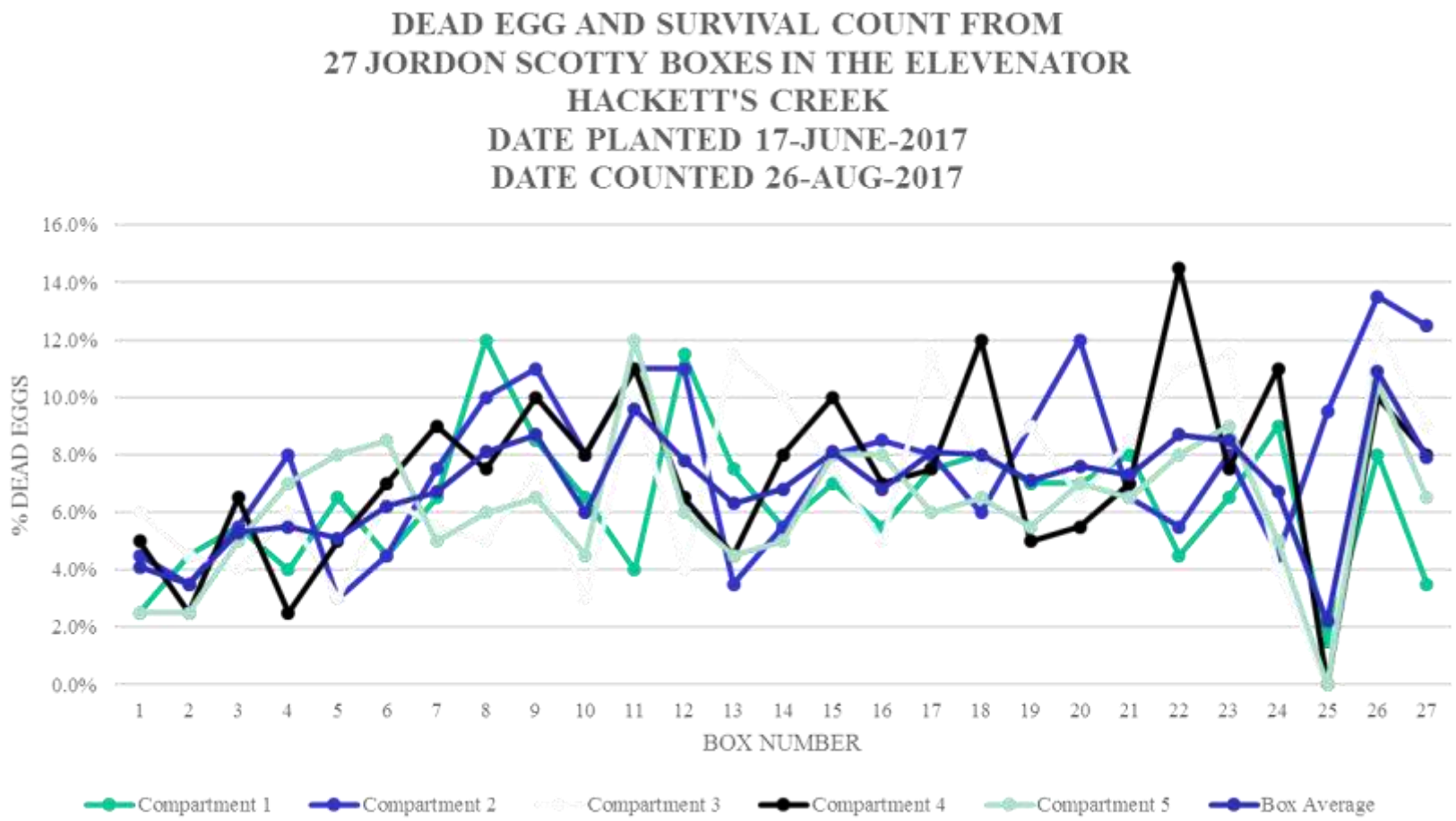
- **Mandamus River/ Dove, 10,000**

Fish in Schools

- **South Island Regions. 3,000**

Eyed ova is planted in secondary salmon spawning streams Annually. Primary streams are left to natural spawning for brood stock returns. Up to 200,000 ova is planted in NC by the teams using the Scotty box system. Numbers of ova per site is predetermined in relation to the rearing capacity of the stream, and the presence of natural returned broods.

Jordon Scotty Boxes Data Collected. Hackett's Creek 2017



Total Eggs	Survival	Survival Percentage	Total Dead Eggs	Dead Egg Percentage
27000	22071	93.1%	1784	6.9%

What is this River?

Clues?

- The Dam was completed in 1943.
- Chinook run severed from returning to the headwaters.
- Lower catchment under severe environmental stress.

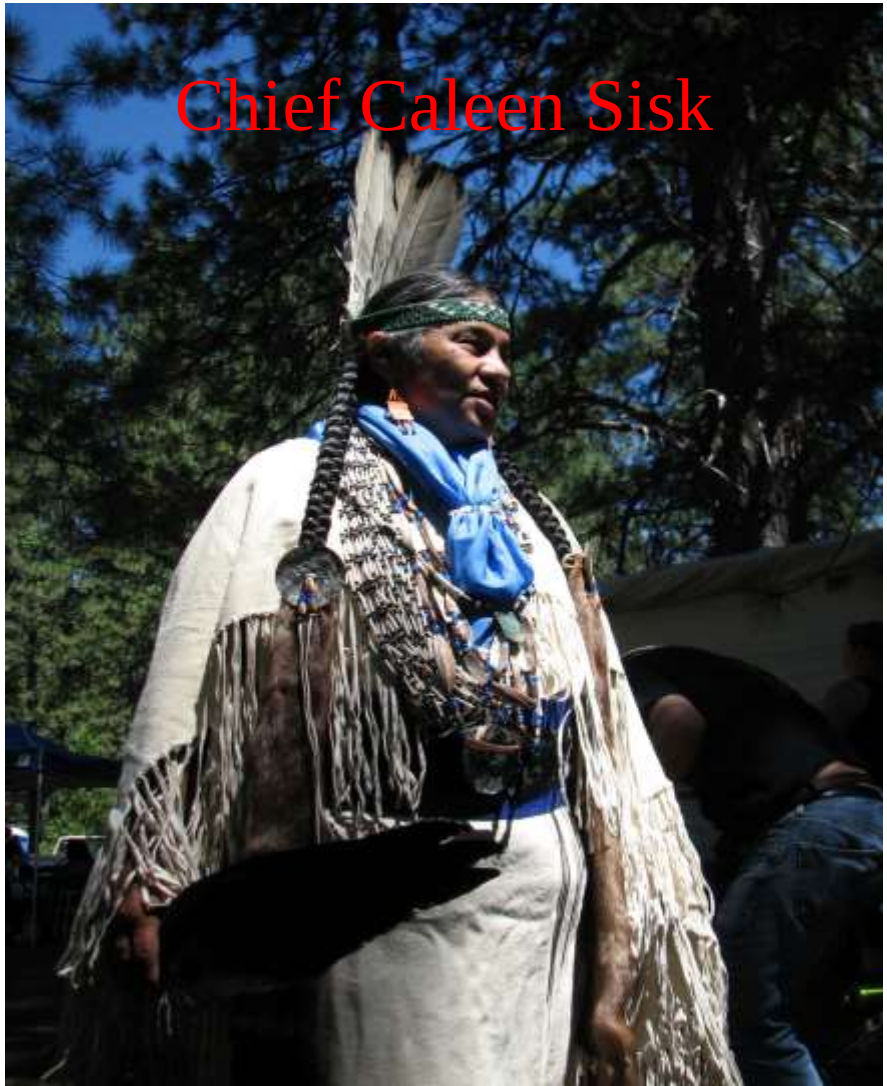
- Snow and spring fed from the highest Mountain in the land.
- Historical huge runs of Chinook.
- The River now intercepted by Hydro lakes and Canals.

The McCloud River California

Tributary of the Sacramento River

The Origin of our NZ Chinook Ova

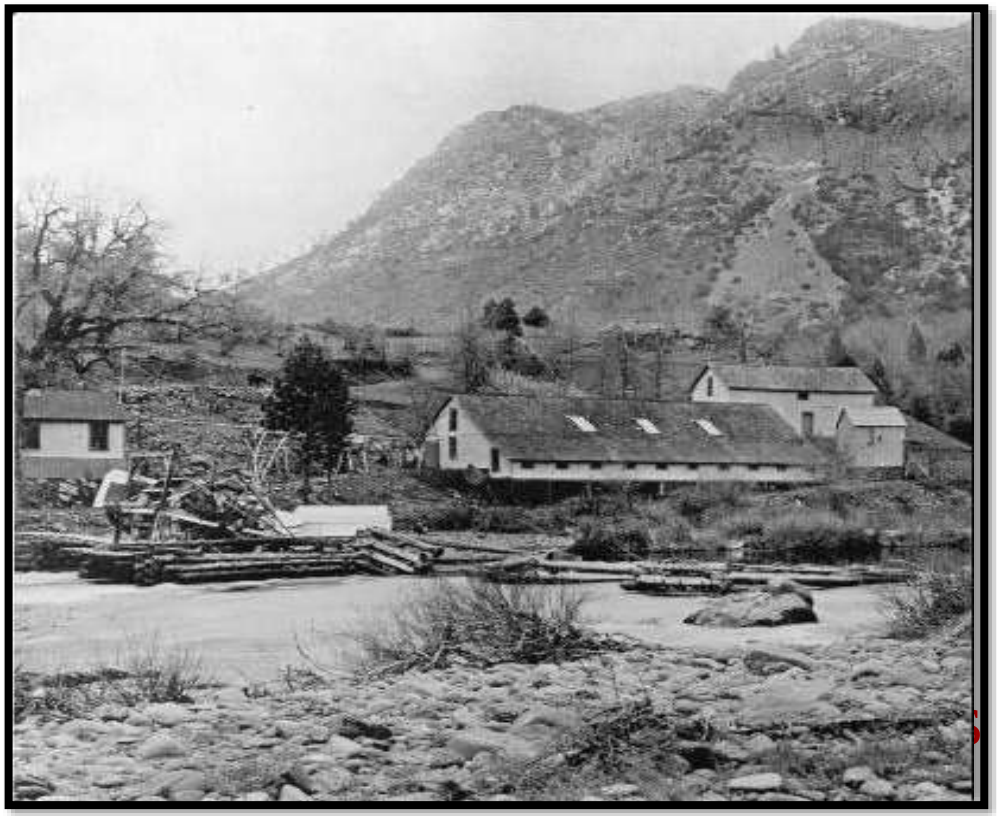
The Winnemem Wintu Tribe and Our Chinook Connection



- Our Salmon runs were introduced to NZ from ova from the McCloud river.
- They were accompanied by a Winnemem tribesman by ship, over 100 years ago .

The Baird Salmon Station McCloud River

Many Winnemem Tribesmen were employed at the hatchery until the completion of the Shasta Dam in 1943.



- The Baird Salmon Station established 1872 by the US Fish Commission's Livingston Stone.
- The hatchery supplied Chinook ova to 37 States, and 14 Countries until it was forced to close after 71 years of operation. NZ was the only country to achieve Chinook acclimatisation success.

Current NC Chinook Salmon Enhancement Programs

Our Original Main Objectives.

- To supplement the natural? fishery, by a target of 10%
- To develop hatchery facilities as an insurance policy in case of fisheries failure.
- To provide additional angler harvest.
- To use as a fisheries monitoring tool, to gain knowledge and to educate.

Why?

- By the year 2000 Anglers and Fish and Game were becoming increasingly aware that salmon populations were declining more frequently.

The Targeted Methods of Enhancement

- Ova Planting Programs.
- Smolt Production grown to 50 - 60 grams slowly, released at 1 year of age. Winter releases at the opposite time of year to natural smolt migration.
- Imprint smolt for a minimum of 1 month, before release into the same water, as the intended river of adult return.
- Adipose Fin Clip to monitor and measure success of angler harvest and brood stock returns.

Monitoring the Successes and Failures

- Angler Phone Surveys to identify fin clipped salmon caught.
- Hatchery Trap Return Counts.
- Angler Harvest monitored and records kept by key angler volunteers at popular fishing places.
- Aerial Spawn counts of headwaters. Percentages compared to hatchery trap returns.

Recent data concerns!

- Recent low flows and water quality are discouraging hatchery stocks from returning to their stream of origin.
- Ova planting success not measurable.
- Many anglers are failing to recognise and report fin clipped salmon.

Waimakariri River Fish and Game Salmon Enhancement Program

Original Enhancement Targets, Angler Harvest Supplemented by 10%

Lower Waimakariri River Angler Harvest % from Hatchery Origin 2012 - 2017

Year	Total Caught	Fin Clipped	Harvest Percentage
2012/13	401 (mouth only)	70	17%
2013/14	661	114	17%
2014/15	589	107	18%
2015/16	492	70	14%
2016/17	583	263	45%

10% ACHIEVED

The harvest percentages above only reflect adipose fin clipped fish caught, and only relate to the fishery downstream of the Kaiapoi River. Other non marked stocks present in the river from ova planting, and hatchery insurance stocks, can not be identified. The true percentages of hatchery salmon, maybe a lot higher.

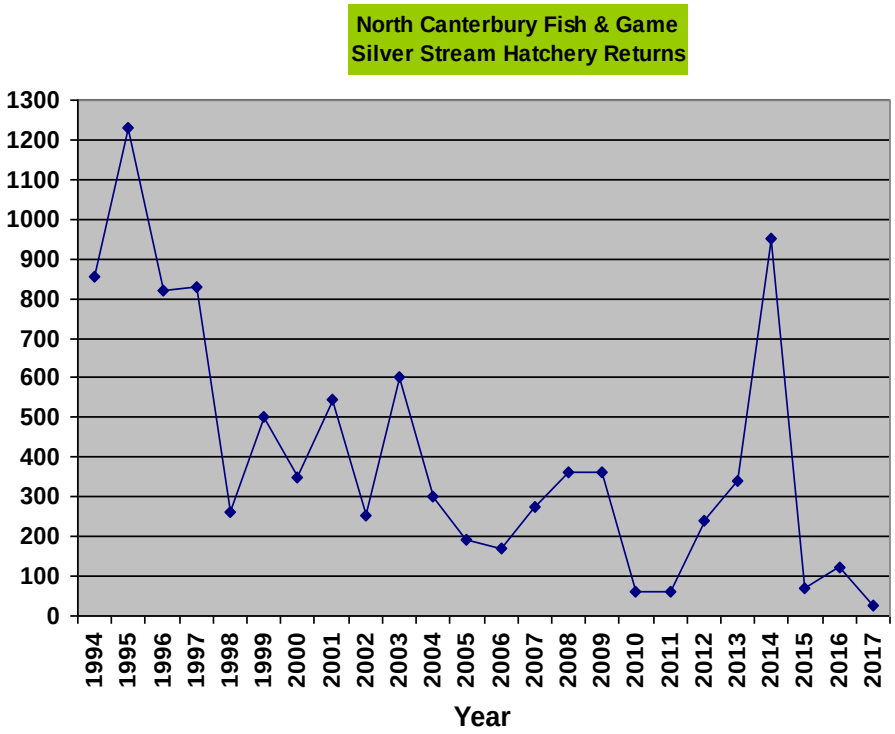
Enhancement Program Trap Returns /inc Angler Harvest to Silver Stream

Silver Stream Trap Data 1994 - 2017

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
SS Trap Returns	855	1230	818	830	260	500	347	547	251	600
Angler 50% Harvest	855	1230	818	830	260	500	347	547	251	600
Trap and Harvest Totals	1710	2460	1636	1660	520	1000	694	1094	502	1200

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
SS Trap Returns	300	193	170	275	360	361	60	60	240	340
Angler 50% Harvest	300	193	170	275	360	361	60	60	240	340
Trap and Harvest Totals	600	578	340	550	720	602	120	120	520	680

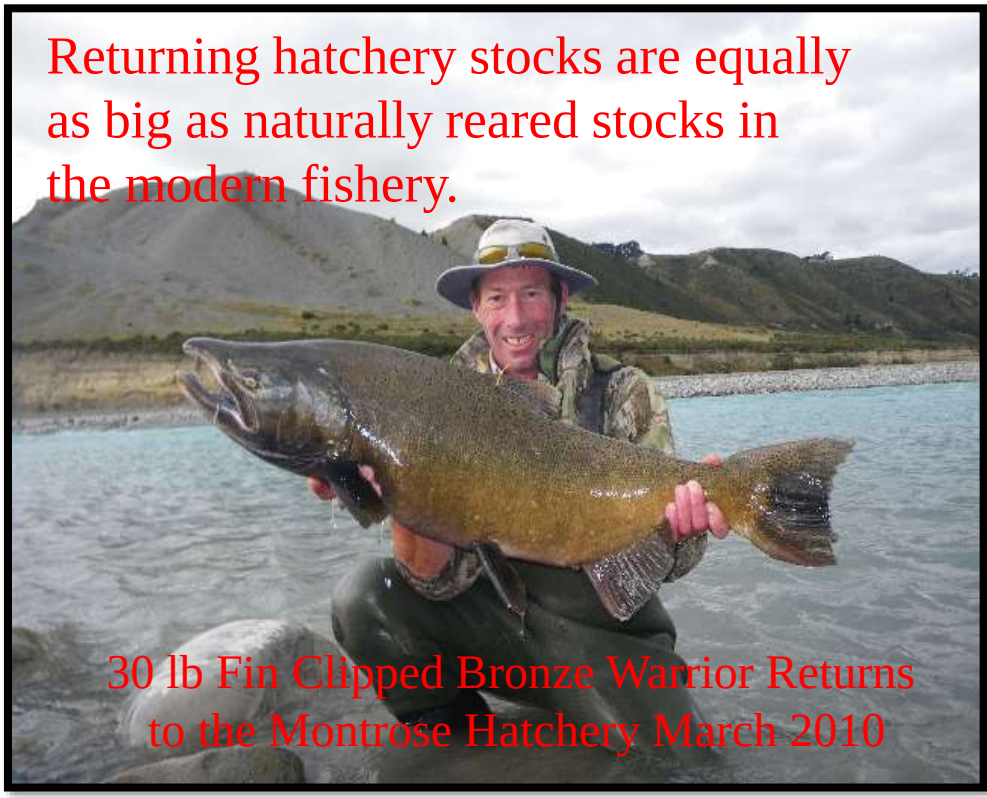
	2014	2015	2016	2017	2018
SS Trap Returns	950	70	120	27	
Angler 50% Harvest	950	70	120	263	
Trap and Harvest Totals	1900	140	240	290	



Angler Harvest calculations applied above, conservative 50% often 60%.

Trap Returns to the hatchery have fallen since 1996 with the exception of 2014. By coincidence 1996 corelates with the last adults returning to spawn, after the withdrawal of the massive "commercial ocean salmon farming" era of the 80s and 90s.

What are Chinook Salmon Enhancement Programs Achieving for our Fishery & The Anglers



- A minimum average angler harvest percentage, over the past 5 years, in the Lower Waimakariri River, of 22% more salmon caught by anglers.
- Although absolute robust data is not available for the Rakaia River, percentages are at least 10% more salmon available for anglers.
- An opportunity for anglers to play a valuable part in actively enhancing our fishery.
- Fisheries / Environment Education for the general public, landowners, and the children!
- A greater public awareness of fisheries values / water issues via media focus.

The percentages of Smolts Surviving to return to the river, and traps as adult Brood Stocks

- The historic Silver Stream trap has always been regarded as being a robust data source for returning hatchery broods. This was until drought conditions over the past 2 years affected fish passage. Adults have been noted spawning considerably downstream of the trap site. Despite these recent poor trap returns over the past 2 years, the data is included.

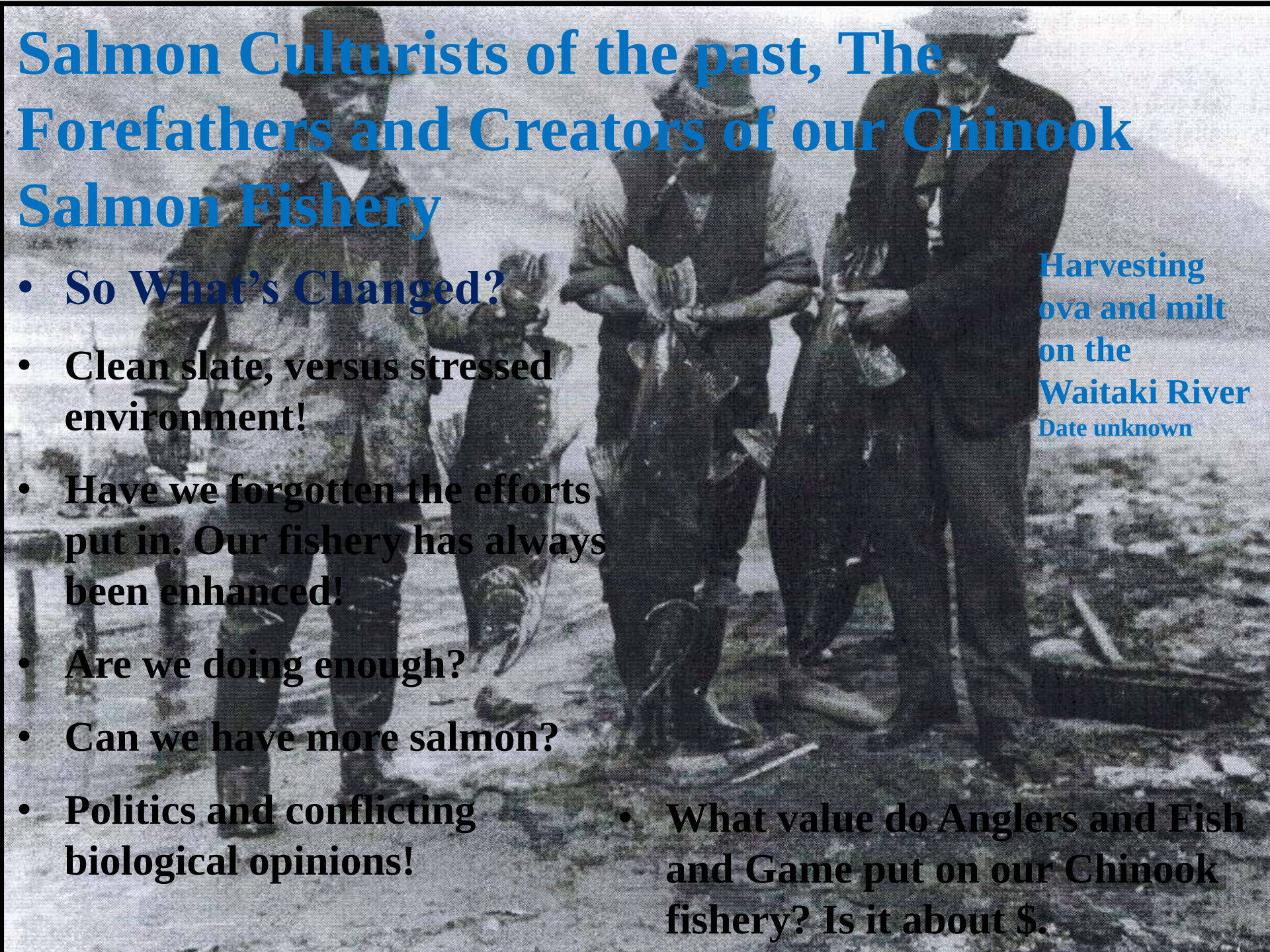
- Fish and Game release 30,000 imprinted smolts annually from the site. Average Trap return percentages, when combined with angler harvest from 1998 – 2007 total 2.3% (7078 salmon) and from 2008 – 2017 total 1.7% (5332 salmon) 50% of these returns are caught by anglers.

- The Rakaia River Montrose Trap has also been affected by low flows affecting brood stock return. Irrigation on the property is depleting the stream during March / April. Historic data reflects a 1% smolt to adult return from releases of 60,000 annually.

- In cases where spawning streams are affected by low flows. Main stem river spawning is of huge concern to hatchery programs needing to secure ova.

Salmon Culturists of the past, The Forefathers and Creators of our Chinook Salmon Fishery

- **So What's Changed?**
- **Clean slate, versus stressed environment!**
- **Have we forgotten the efforts put in. Our fishery has always been enhanced!**
- **Are we doing enough?**
- **Can we have more salmon?**
- **Politics and conflicting biological opinions!**



Harvesting ova and milt on the Waitaki River
Date unknown

- **What value do Anglers and Fish and Game put on our Chinook fishery? Is it about $.**

In Summary;

What steps are being taken in North Canterbury to ensure that Chinook Salmon are available to future generations?

- Strategic steps have been taken in the way of securing quality new locations which offer potential for Salmon Enhancement Programs.
- NC Fish and Game are using Salmon Programs and releases to raise public, and land owner awareness to water quality issues.
- An Army of Volunteers numbering in the hundreds are working on projects alongside Fish and Game.
- North Canterbury Fish and Games Enhancement Programs, and infill structures, are already being stepped up.
- Do we have the right tools?




We sure do!