Appendix 50
Creston National Fish Hatchery: Hatchery and Genetic Management Plan

HATCHERY AND GENETIC MANAGEMENT PLAN

Creston National Fish Hatchery

HATCHERY AND GENETIC MANAGEMENT PLAN RESIDENT FISH VERSION (HGMP-RF)

Hatchery Program: Stocking of Offsite Waters for Hungry Horse Mitigation-Creston NFH

Species or Hatchery Population/Strain:bull trout, Westslope cutthroat trout, rainbow trout

Agency/Operator: USFWS-Creston National Fish Hatchery

Watershed and Region: Flathead Subbasin, Mountain-Columbia Province

Date Submitted: 9/29/00

Date Last Updated:

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Stocking of offsite waters for Hungry Horse fisheries mitigation – Creston National Fish Hatchery

1.2) Species and population (or strain) under propagation, ESA/population status.
Westslope cutthroat trout, *Oncorhynchus clarki lewisi*
Rainbow trout, *Oncorhynchus mykiss*
Bull trout, *Salvelinus confluentus* - threatened species

1.3) Responsible organization and individuals

Name (and title): Donald A. Edsall, Hatchery Manager
Agency or Tribe: US Fish and Wildlife Service
Address: 780 Creston Hatchery Road, Kalispell, MT 59901
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:
Montana Department of Fish, Wildlife, and Parks (MDFWP) and the Confederated Salish and Kootenai Tribes (CSKT) manage the waters stocked under this program.

1.4) Funding source, staffing level, and annual hatchery program operational costs.
This program funded by Bonneville Power Administration.
The annual budget for 2001 is $173,292, and includes 1.95 FTE's

1.5) Location(s) of hatchery and associated facilities.
The Creston NFH is located on Mill Creek, a tributary of the Flathead River located several miles above Flathead Lake in northwest Montana.
Latitude 48d-12min-30sec North, Longitude 114d.-7min-30sec West

1.6) Type of program(s).
Stocking portion of program is isolated harvest of Westslope cutthroat trout and rainbow trout from waters lacking natural reproduction or connection to natural populations.
Culture of bull trout is for development of rearing techniques and provision of eggs for research purposes.

1.7) Purpose (Goal) of program(s).

The goal of this program is to mitigate for Hungry Horse Dam hydro-related losses of 415,000 salmonids annually from Flathead Lake by partially offsetting lost angler opportunity and reducing pressure on native stocks.

1.8) Justification for the program.

Stocking of small lakes and reservoirs isolated within the interconnected waters of the Flathead subbasin with 3-4" hatchery produced fish will, after one to two years growth, provide recreational angling opportunities for catchable sized trout and partially offset the affects of fishing closures and reduced limits on weak but recoverable native populations of Westslope cutthroat and bull trout remaining in the Flathead Lake and River system.

Research into culture and biology of hatchery-reared bull trout benefits the listed populations through increased knowledge that may be useful in future restoration activities, and by reducing the need to take individuals from wild stocks.

1.9) List of program "Performance Standards."

1. Provide predictable, stable and increased recreational harvest opportunity for westslope cutthroat trout and rainbow trout to help mitigate for native fisheries lost due to construction and operation of Hungry Horse Dam

2. Enhance tribal, local, and state economies.

3. Conduct within hatchery research and provide eggs to researchers to increase our knowledge of listed bull trout culture and biology.

1.10) List of program "Performance Indicators," designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

The offsite lakes program is monitored through periodic gill net surveys, angler interviews and the annual statewide angler creel census. Stocking rates are established to a large degree by trial and error. Gill netting provides data on species relative abundance, growth rates and fish condition factor. Angler surveys are qualitative indicators of catch rates, angler satisfaction and rough estimates of harvest. Although rigorous quantitative analyses of CPUE, survival and total harvest are possible, the number of lakes involved makes this level of monitoring economically impractical. Rigorous sampling is reserved for aspects of the Hungry Horse mitigation program directed toward native species restoration. Listed bull trout are not present in any of the small, closed-basin waters stocked under this program, but are benefited through shifting of angler harvest away from natural but weak bull trout and westslope cutthroat trout populations.

Evaluate performance of listed bull trout in artificial production; feed requirements, growth rates, age at maturity, fecundity, effective lifespan of broodfish. Provide supply of good quality eyed eggs to partners researching biology of bull trout and collect information on results of this outside research.

1.10.2) "Performance Indicators" addressing risks.

No identified risks to native or listed species.

1.11) Expected size of program.

Produce up to 100,000 – 3" hatchery cutthroat trout and up to 100,000 – 3" rainbow trout and stock fish to offsite mitigation waters as requested by management agencies. Provide up to 200,000 bull trout eggs for other research programs

1.11.1) Proposed annual broodstock need (maximum number of fish).

This program employs fish and eggs obtained from captive hatchery broodstocks only.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Anticipated schedule for 2001, subject to change.

Life Stage	Release Location		Annual Release Level
Eyed Eggs			
Unfed Fry			
Fry			
Fingerling	Rogers Lake	(CTT)	15,000
	Lion Lake	"	6,000
	Bailey Lake	"	4,000
	McWhorter's Pond	"	2,400
	Bootjack Lake	"	1,000
	Myron Lake	"	1,500
	Hidden Lakes	"	2,500
	McDonald Lake	"	10,000
	St. Mary's Lake	"	20,000
	Mission Lake	"	10,000
	Turtle Lake	"	2,000
	Upper Jocko Res.	"	3,000
	Lower Jocko Res	"	7,000
	Upper Twin Lake	"	2,000
	Lower Twin Lake	"	2,000
	Swartz Lake	"	5,000
	Pablo Res.	RBT	20,000
	McDonald Ponds	"	5,000
	Rainbow-Dog Lake	"	10,000

Life Stage	Release Location	Annual Release Level
Yearling		

1.12) Current program performance, including estimated survival rates, adult production levels, and escapement levels. Indicate the source of these data.
Qualitative assessments have shown that small, closed basin lakes yield an efficient hatchery plant to angler creel ratio. Project lakes are put, grow and take fisheries, entirely dependent on artificial production to support the fishery. Many have been chemically rehabilitated to remove illegally introduced species (e.g. yellow perch, bluegill, pumpkinseed, northern pike etc.). Gill netting, site visits to interview anglers and an annual statewide angler creel census provide managers with qualitative information on species composition, growth, condition factor and angling success. The number of lakes involved precludes detailed assessments of survival rates, total harvest or reliable estimates of CPUE. Periodic spot checks at individual lakes have revealed great success. For instance, angler pressure on Lion Lake grew to the highest of any small lake in northwest Montana. Rogers Lake now supports a genetic reserve for Red Rocks Lake fluvial grayling and a major fishery for westslope cutthroat trout (Knotek et al. 1997).

1.13) Date program started (years in operation), or is expected to start.
Stocking of offsite waters under this program began in 1998.

1.14) Expected duration of program.
Duration is permanent for foreseeable future.

1.15) Watersheds targeted by program.
Offsite fish stocking to the Flathead sub-basin.
Findings of bull trout research are applicable over fishes' entire range.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.
Mitigation stocking of Westslope cutthroat trout directly into Flathead Lake was deemed not feasible due to probable heavy predation by non-native lake trout. This is based on the results of the attempted kokanee salmon reintroductions of 1992-1997.

SECTION 2. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

2.1) Describe alignment of the hatchery program with other hatchery plans and policies (e.g., the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.
All hatchery fish rearing and stocking and bull trout egg production is consistent with the NPPC Artificial Production Review document 99-15, and with USFWS fish health, genetics, and distribution plans and policies. The program will align with the Flathead sub-basin summary.

2.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which the program operates.

This program is a part of, and consistent with the Hungry Horse Dam Fisheries Mitigation Plan, an agreement between the Service, the Montana FWP, and the CSKT which was implemented in 1992.

2.3) Relationship to harvest objectives.
Hatchery produced fish are stocked in closed basin lakes with no reproduction potential to provide harvest and recreational opportunities for anglers, and reduce fishing pressure on natural populations. There are no risks to natural populations.

2.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last 12 years (1988-99), if available.
The offsite lakes program balances public desire for harvestable fisheries for rainbow and westslope cutthroat trout. The number of lakes involved precludes detailed assessments of harvest levels and rates. Angler preference and pressure can be assessed through the annual statewide creel census.

2.4) Relationship to habitat protection and purposes of artificial production.
Nearly all of the offsite lakes planted under this program do not support natural reproduction. Where natural reproduction is possible, the primary objective is to create genetic reserves for isolated populations of native stocks. In these cases, habitat restoration is performed to enhance fish passage and natural reproduction in the closed system, and hatchery produced fish are not utilized. Hatchery production placed in lakes lacking reproductive habitat helps to mitigate for good habitat permanently blocked by Hungry Horse Dam.

2.5) Ecological interactions.
This program does not supply fish to waters scheduled for native species restoration. The closed basin lakes that are stocked through this program provide alternative fisheries to meet public demands for harvest and partially offset fishing bans or reduced limits enacted for native species recovery. This program may indirectly benefit native species recovery by redirecting harvest away from sensitive recovery areas in the contiguous Flathead watershed. Rehabilitated lakes remove undesirable species that are a source for additional illegal introductions (e.g. illegally introduced yellow perch, northern pike, sunfish, fathead minnow and in one case, grass carp). Occasionally, illegal introductions occur after lakes have been reclaimed and fisheries established. This negatively impacts the program. An additional chemical treatment may be required within approximately ten years. During the interim, fisheries established by this program remain viable until the undesirable introduced fish become reestablished.

SECTION 3. WATER SOURCE

3.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.
The Creston NFH has non-consumptive water rights on natural springs with flows ranging from 12,000 to 18,000 gpm, depending on the season and rainfall totals. The springs are a constant 47 F, but the water is warmed or cooled (depending on season) by a

24-acre man-made impoundment (Jessup Mill Pond) before entering the hatchery. Annual range is 39F to 52F. The water is well oxygenated (10ppm) and slightly basic (pH-7.6). The water does become nitrogen gas supersaturated (as high as 130%) during periods when the water temperature is above 45F (March through October). This causes a chronic stress to all fish species reared, but cutthroat trout are more susceptible than others. Bacterial infections causing various diseases and some loss of fish can occur. The hatchery is equipped with aeration columns to degas water supplying a quarter of the rearing space, and cutthroat and bull trout are held in these areas.

The hatchery building, where egg incubation, hatching, and early rearing takes place, makes use of a 260' deep- 14" diameter well that has an artesian flow of 190 gpm, and sustained pumping flow of 600 gpm. Water is aerated to 10 ppm oxygen, and nitrogen gas is not a problem. Temperature is a constant 47F. The spring source water described in the previous paragraph is not assured to be disease free, and since 1995 has not been used in the hatchery.

The isolation room, located on one end of the feed storage building, is supplied by a 200' deep – 6" diameter well with useable 10 gpm artesian flow and 100 gpm pumped flow. A chiller unit cools the 47F water to levels suitable for incubating bull trout eggs (39-42F).

3.2) Indicate any appropriate risk aversion measures that will be applied to minimize the likelihood for the take of listed species as a result of hatchery water withdrawal, screening, or effluent discharge.

Listed fish such as bull trout are not present in Jessup Mill Pond nor are they found in Mill Creek on or below the hatchery. Bull trout occasionally enter Mill Creek from the Flathead River (6 miles downstream) it is not, and historically was not, bull trout spawning habitat.

SECTION 4. FACILITIES

4.1) Broodstock collection, holding, and spawning facilities .

The bull trout captive broodstock are held in two 8'x 80' x 2.5' concrete raceways receiving 325 gpm each of Jessup Mill Pond water. The raceways are completely covered with a vinyl shelter tent. The fish are manually spawned in the raceways.

4.2) Fish transportation equipment (description of pen, tank truck, or container used).

Rainbow and cutthroat trout stocked under this program are transported in either a 1991 Ford F-800 diesel truck with three –500 gallon fiberglass tanks mounted to the frame, or in a two-compartment 400 gallon fiberglass tank carried in box of a 1994 Chevy _ ton pickup. All tanks are supplied with ceramic air stones for oxygen, and aerators for water circulation.

43) Incubation facilities.

Bull trout eggs are incubated in Heath-Tray type incubators located in the isolation room mentioned in 3.1 above. After reaching the eyed stage, eggs are shipped via Fed Ex to various researchers.

Eyed cutthroat and rainbow trout eggs received from other facilities are placed in 8" dia. x 22" high custom-made PVC egg jars located in early rearing tanks in main hatchery

building. After hatching, the sac-fry may hold within the jars or volitionally flow from the jars directly into the rearing tanks

4.4) Rearing facilities.

Early rearing occurs in twenty-three 12'x3'x2' tanks (capacity approx. 72 cubic feet) located in hatchery tank room. Sixteen of the tanks are concrete and seven are fiberglass and were installed in 1992. Fish are reared in these units until at least 2" in length. Fish over 2" long are placed in outdoor concrete raceways measuring 8' x 80' x 2.5'. Spring water for twelve of the raceways is gravity fed through 6' degassing columns to remove supersaturated nitrogen gases. Eight of these 12 are covered with vinyl tent enclosures. Another 24 raceways are not covered and do not have nitrogen degassing capability, but are covered with netting to keep predatory birds out. An additional 12 raceways are currently not useable. Water flow rates are usually set at 300-350 gpm per raceway, single pass only.

4.5) Acclimation/release facilities.

None

4.6) Describe operational difficulties or disasters that led to significant fish mortality.

None

4.6.1) Indicate available back-up systems, and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Water flow to bull trout broodfish is all gravity flow. Water supply to incubating bull trout eggs is via artesian well. Loss of flow is not possible except in event of major natural disaster.

To help prevent spread of fish pathogens, raceway cleaning brushes used for bull trout brood (and all fish on hatchery) are not used interchangeably with other units, and are disinfected after each use.

Incubating bull trout eggs are housed in isolation unit to minimize contact with fish pathogens that may be present in other areas of hatchery.

Hatchery is staffed 7 days a week.

4.6.2) Indicate needed back-up systems and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

A high fence would need to be placed around raceways housing bull trout broodfish to absolutely ensure their safety from vandals and illegal fishermen during hours of darkness.

SECTION 5. BROODSTOCK ORIGIN AND IDENTITY

5.1) Source.

Bull trout broodstock are progeny of wild fish captured, artificially spawned, and released in Holland Creek, a tributary of the Swan River, a major drainage of the Flathead basin.

Westslope cutthroat trout eggs are supplied from broodstocks held at the Washoe Park State Fish Hatchery, in Anaconda, MT. Original source of this broodstock was genetically pure wild fish found in tributaries of the South Fork of the Flathead River (Hungry Horse Reservoir).
Arlee strain rainbow trout eggs are supplied from broodfish held at the Ennis National Fish Hatchery, Ennis, MT.

5.2) Supporting information.

5.2.1) History.

The existing hatchery bull trout broodstock were originally collected as eggs from 7 wild females (mated one on one) in the Swan River drainage of NW Montana in September 1993. About 21,000 eggs were collected. In 1996, we randomly selected 400 of these bull trout to keep for captive broodstock investigations, while all remaining surplus fish were stocked into Duck Lake on the Blackfoot Indian Reservation. Due to the small number of founding parents, no attempt has been made to perpetuate this broodstock. It will eventually die out.

5.2.2) Annual size.

N.A.

5.2.3) Past and proposed level of natural fish in broodstock.

None

5.2.4) Genetic or ecological differences.

None known

5.2.5) Reasons for choosing Broodstock traits

N.A.

5.2.6) ESA-Listing status

Bull trout are listed as a threatened species. Westslope cutthroat trout were petitioned for listing, but listing was deemed not warranted by the USFWS.

5.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects that may occur as a result of using the broodstock source.

N.A.

SECTION 6. BROODSTOCK COLLECTION

6.1) Life-history stage to be collected (eggs, juveniles, adults).

N.A.

6.2) Collection or sampling design.

Adult bull trout were captured with dip nets during their spawning run up Holland Creek, a small stream inlet to Holland Lake located in the Swan River drainage of the Flathead basin. Seven females were captured in 1993, and 3 females in 1994. Fish were anesthetized before egg collection began. The fish were only partially spawned and returned to the stream unharmed. Eggs were fertilized 1:1 with males captured at the same time.

6.3) Identity.

All bull trout spawned during the 1993 & 1994 egg takes were from a natural population. No hatchery origin fish were or are now present in the population.

6.4) Proposed number to be collected:

None

6.4.1) Program goal (assuming 1:1 sex ratio for adults):

N.A.

6.4.2) Broodstock collection levels for the last 12 years (e.g., 1988-99), or for most recent years available:

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1988					
1989					
1990					
1991					
1992					
1993				20,800	
1994				12,000	
1995					
1996					
1997					
1998					

Year	Adults Females	Males	Jacks	Eggs	Juveniles
1999					

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

6.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.
N.A.

6.6) Fish transportation and holding methods.
N.A.

6.7) Describe fish health maintenance and sanitation procedures applied.
Bull trout brood fish are treated for occasional bacterial infections when they occur; usually during periods of higher stress such as after spawning season, or in early spring when water temperature begins to rise. Fish are treated with oxytetracycline at 1.44% of diet for 10 days, or Romet-30 at 2% of diet for 10 days to clear up infection. Cleanliness is maintained by daily sweeping of raceway floors with nylon/steel bristled brushes to remove waste products and excess feed.

6.8) Disposition of carcasses.
N.A.

6.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed species resulting from the broodstock collection program.
N.A.

SECTION 7. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

7.1) Selection method.
All egg-producing bull trout females from the hatchery broodstock are spawned when ripe.

7.2) Fertilization.
Ripe eggs are stripped from anesthetized (MS-222) female bull trout using air spawning technique (2 psi oxygen introduced into body cavity via needle to force egg expulsion). Eggs from 5 females are pooled in pan containing 1.5% saline solution and are fertilized with pooled milt pre-collected from 5 males. To remove any external pathogens, newly fertilized eggs are water hardened in 0.75% iodine solution for 60 minutes prior to placement in incubation trays.

7.3) Cryopreserved gametes.
N.A.

7.4) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

N.A.

SECTION 8. INCUBATION AND REARING

8.1) Incubation:

8.1.1) Number of eggs taken/received and survival rate at stages of egg development

Bull trout eggs taken by USFWS personnel.

Year	# of eggs		% to eyeup	% to hatch
	Wild	Captive		
1993	20,800		97.4	97.1
1994	12,000		?	?
1997		71,641	70.5	55.4
1998		201,183	76.0	shipped
1999		155,474	67.4	shipped
2000		136,037	?	shipped

Westslope cutthroat trout eyed eggs received from Washoe Park State Fish Hatchery, Anaconda, Montana. (captive broodstock)

Year	# eyed eggs received	% to hatch
1997	366,472	81.8
1998	212,517	68.2
1999	339,254	84.9
2000	300,734	84.8

Arlee strain rainbow trout eggs received from Ennis National Fish Hatchery, Ennis, Montana.

Year	# eyed eggs received	% to hatch
1997	118,030	84.7
1998	119,180	75.5
1999	111,354	93.4

8.1.2) Loading densities applied during incubation.

Bull trout eggs incubated in Heath trays

Year	Egg Size (#/oz)	Flow Rate (gpm)	# Eggs/Tray
1997	360	3.3	11,940
1998	337	5.0	28,740
1999	287	4.5	25,912
2000	263	3.8	17,005

Westslope cutthroat trout eyed eggs incubated in hatching jars (Vol.=1000 cubic inches).

Year	Egg Size (#/0z)	Flow Rate (gpm) Per Jar	# Eggs/Jar
1997	372	5.0	52,285
1998	381	5.0	42,503
1999	340	5.0	48,464
2000	417	5.0	35,385

Arlee rainbow trout eyed eggs incubated in hatching jars (Vol=1000 cubic inches).

Year	Egg Size (#/oz)	Flow Rate Per Jar (gpm)	# Eggs/Jar
1997	290	5.0	39,343
1998	296	5.0	39,726
1999	277	5.0	37,118

8.1.3) Incubation conditions.

For bull trout:
Chilled incubation water averages 5.8C , fluctuating less than +/- 1C as chiller cycles on and off. Water is pumped from well and dropped through aeration/degassing column before entering chiller. Oxygen monitoring is not necessary, concentration is 9.5 to 10.2 ppm. Eggs incubated in 8-tray Heath stack.

For rainbow and cutthroat:
Artesian flow well water averaging 47F, falls through aeration column and enters hatchery. Oxygen concentration is 10.0 to 10.5 ppm. Eyed eggs incubated and hatched in 8" dia x 20" long PVC jars with upwelling flow.

8.1.4) Ponding.

Bull trout fry from the 1993 and 1994 wild spawn takes were removed from incubator trays and placed in rearing troughs at time of yolk-sac absorption. This occurred in early March, approx. 6 months after spawning.

Westslope cutthroat fry volitionally leave hatching jars and directly enter 72 cubic foot concrete hatchery rearing tanks (in late July). Depending on hatchery space, the fish may be moved to outdoor raceways in January (when 2" in length), or remain in hatchery tanks until stocked in May or June.

Rainbow fry also volitionally leave hatching jars and enter rearing tanks (in late January), and are moved to outdoor raceways in May after they attain 2" length.

8.1.5) Fish health maintenance and monitoring.

Incubating bull trout eggs are treated with a 1:600 formaldehyde solution for 15 minutes every other day for control of *Saprolegnia spp.* After eye-up, eggs are lightly shocked, and dead eggs are hand picked with a suction bulb every other day.

Eyed eggs of rainbow and cutthroat trout do not require chemical treatments in the later stages of incubation in hatching jars. Dead eggs or fry are removed daily with hand pickers before, during, and after hatching takes place.

8.1.6) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to fish during incubation.

There would be no adverse genetic or ecological effects to environment caused by loss of incubating eggs from any of these three species. Escape of bull trout eggs or fry from isolation room to environment is not possible due to fish containment system in place.

8.2) <u>Rearing</u>:

8.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to release) for the most recent twelve years (1988-99), or for years dependable data are available..

Bull Trout survival

Year	% fry to fingerling	% fingerling to release
1994	95.2	66.5
1995	no data	

Westslope cutthroat trout survival

Year	% fry to fingerling	% fingerling to release
1998	60.7	80.9
1999	74.1	68.6
2000	67.7	74.6

Arlee rainbow trout survival

Year	% fry to fingerling	% fingerling to release
1998	88.2	67.9
1999	91.1	62.1
2000	93.4	98.0

8.2.2) Density and loading criteria (goals and actual levels).

The maximum desirable Flow Index for Creston NFH is 1.56; where permissible weight of fish=1.56 X fish length (inches) X inflow (gpm).
The maximum Flow Index attained with Westslope cutthroat trout was 1.0 in June, 2000.
The maximum attained with Arlee rainbow trout was 1.29 in June 2000.

The maximum Density Index desirable at Creston is 0.5; where permissible weight of fish=0.5 X Volume of tank (cubic feet) X fish length (inches).
The maximum density index attained with Westslope cutthroat trout was 0.14 in June, 2000.
The maximum attained with Arlee rainbow trout was 0.29 in June, 2000.

8.2.3) Fish rearing conditions

Constant water temperature recordings at Creston NFH indicate an annual temperature range from 39F to 52F, with an average temperature of 47F. Minimum dissolved oxygen readings at tailscreens range from 8 to 9 ppm, and are measured only occasionally. Total gas pressure (TGP) is below saturation during colder months, (November to March) but becomes supersaturated during times of warmer temperatures. A high of 108% to 112% is attained in late spring, causing some chronic stress and low mortality to fish exposed to such. Degassing columns were installed in 1992 to treat water supplying lower 12 raceways. TGP will run

<103% with columns operated in open mode, and below 100% in closed mode with oxygen injection. Koch ring media in columns are replaced once a year. Westslope cutthroat trout are very susceptible to higher gas pressures and are either reared inside the hatchery building, where TGP remains <101%, or in the raceways receiving treated water. Rainbow trout are lightly affected by the high TGP.

To help prevent disease, all empty raceways are thoroughly cleaned and sanitized with a high-pressure washer before restocking with fish. The upper 24 raceways are covered with bird netting, which helps prevent stress and losses to herons, ducks, and osprey. Eight of the lower raceways have shelter covers which provides shade and helps to keep birds out. However, mink and kingfishers do account for some predation.

8.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Sample counts (#/lb.) are made when fish are moved to other rearing units, or hauled off the hatchery for stocking. Condition factors are not measured directly in most cases. Lengths are estimated from standard species condition factor charts.

Monthly temperature units (T.U.) growth data from 3 year classes of Westslope cutthroat trout indicates an average of 67 T.U.'s per inch growth. (1 T.U. = 1 degree above freezing for 30 days)

For Arlee rainbow trout, the 3 year average was 29 T.U.'s per inch growth.

The average number of T.U.'s available annually at Creston NFH is 169.

8.2.5) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Cutthroat trout are started on Biodiet starter #1 and #2 and then are fed the USFWS specification trout diet (dry feed), milled by either Silver Cup or Rangens. Rainbow trout are fed the dry Service diet only. Bull trout broodstock are fed the dry Service brood diet.

About 1/3 to _ of daily feed is applied through 12-hour belt feeders, (Two per raceway, one per hatchery tank) with the rest hand broadcast 3 times a day. Fish are fed to about 95% of satiation.

The 3-year average feed conversion (food fed/weight gain) for Westslope cutthroat trout is 1.53, for Arlee rainbow trout it is 0.98.

8.2.6) Fish health monitoring, disease treatment, and sanitation procedures.

Fish are sampled annually for disease pathogens by the USFWS Bozeman Fish Health Lab. Sixty fish are sacrificed from each lot located on the station and tissues are tested for whirling disease, bacterial and viral infections. Moribund fish may be sent to the lab anytime for inspection if an epizootic is in progress.

Westslope cutthroat trout must be treated for bacterial "coldwater disease" *(Flexibactor spp)* soon after swimup, and as outbreaks occur later. They are treated with 4% oxytetracycline in the diet for 10 days to control the disease. Other species reared at Creston are not affected. Outbreaks of bacterial gill disease (*Aeromonas or Psuedomonas spp)* , caused by overfeeding or overcrowding, are rare, but are controlled by adding 12ppm chloramine-t to the water for one hour, every other day for 3 days.

To maintain good sanitation, hatchery tanks are cleaned with brushes twice a day and outdoor raceways once a day, to remove uneaten feed and fecal matter. Each hatchery tank has its own cleaning brush, which is not used interchangeably with other tanks. Outdoor raceway brushes are placed in nearby tubs containing a sterilizing solution after each use.
Pathogen-free well water only is used in the hatchery building. Footbaths and handwashing are required before entering the tank room.
And, as stated before, empty raceways are cleaned with a high pressure sprayer (4000 psi) before the next use.

8.2.7) Indicate the use of "natural" rearing methods as applied in the program.
All rearing units at the Creston NFH are made of concrete or fiberglass.

8.2.8) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to fish under propagation.
None employed.

SECTION 9. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

9.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g., "Elwha River").*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling	100,000 wes. CTT 100,000 RBT	115/lb 50/lb	May-June June-July	Flathead River Flathead River
Yearling				

9.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse: All waters listed in Sec. **1.11.2**
Release point:
Major watershed: Flathead River
Basin or Region: Columbia River Basin/Mountain Columbia Province

9.3) Actual numbers and sizes of fish released by age class through the program.
Source: Creston National Fish Hatchery, fish distribution records.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
					Arlee	RBT		
1998					34,964	16.33		
1999					50,938	19.08		
2000					38,976	8.10		
					Westslope	CTT		
1998					101,175	6.40		

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1999					63,653	7.44	2,834	34.9
2000 Average					94,838	3.93		

9.4) Actual dates of release and description of release protocols.

Fingerling fish are stocked when receiving waters have reached a suitable temperature, (50-55F) generally mid-May to mid-June. Fish are transported to the lakes via tank truck.

9.5) Fish transportation procedures, if applicable.

A fish pump is used to lift fish into a dewatering box, from which they enter the distribution truck tanks via a chute. Fish are enumerated by water displacement in the tanks. Oxygen is metered from a liquid O2 tank at the rate of 1 lpm per 100 lb of fish, through ceramic stones into tanks. Each tank has 3 aerator pumps for water circulation and CO2 dispersal. Temperature increase is minimal in the insulated fiberglass tanks. Cutthroat densities are kept below _ lb/gal, and rainbow densities are no more than 1.5 lb/gal. Fish may remain in transit for 1 to 6 hours, depending upon destination and number of lakes stocked.

9.6) Acclimation procedures

Acclimation procedures are not necessary.

9.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery component.

None

9.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

There have been no excess cutthroat so far, and none are expected. In 2000, excess rainbows were provided to state managed recreational waters within the Flathead subbasin.

9.9) Fish health certification procedures applied pre-release.

Each lot of fish reared at the Creston NFH is sampled annually for disease status by personnel of the USFWS Bozeman Fish Health Center.

9.10) Emergency release procedures in response to flooding or water system failure.

Creston has a gravity flow water supply. Spring flow is dependable year-round between 12,000-18,000 gpm. The watershed is too small to experience a flood event. However, the dam holding back Jessup mill pond is unstable and could fail during a large earthquake. A design is now being formed to either repair the dam, or drain the pond and enclose the hatchery supply springs in pipeline. Service funds have been appropriated, and construction will take place in 2002.

9.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed species resulting from fish releases.
Fish stocked under this program are no threat to listed species (bull trout).

SECTION 10. PROGRAM EFFECTS ON ALL ESA-LISTED, PROPOSED, AND CANDIDATE SPECIES (FISH AND WILDLIFE)

10.1) List all ESA permits or authorizations in hand for the hatchery program.

DOI-USFWS Federal Fish and Wildlife Permit PRT-704930, subpermit sp98-37.00
Allows all hatchery activities associated with bull trout described in this plan

10.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.
None under this program.

10.2.1) Description of ESA-listed, proposed, and candidate species affected by the program.
None

Identify the ESA-listed population(s) that will be directly affected by the program.

One time affect on bull trout in several years pre-listing (1993&1994) through take of approximately 33,000 eggs from natural Swan drainage bull trout population.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.
None

10.2.2) Status of ESA-listed species affected by the program.

- **Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds** (*see definitions in "Attachment 1").*
NA

- Provide the most recent 12 year (e.g. 1988 - present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.
NA

- Provide the most recent 12 year (e.g. 1988 - 1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.
NA

- Provide the most recent 12 year (e.g. 1988 - 1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.
NA

10.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed species in the target area, and provide estimated annual levels of take *(see "Attachment 1" for definition of "take")***. Provide the rationale for deriving the estimate.**
None

- Describe hatchery activities that may lead to the take of listed species in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
None

-Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.
Take of 20,000 fertilized eggs in 1993 and 12,800 fertilized eggs in 1994 from total of 10 wild female bull trout in the Swan River drainage. No observed injury or mortality to adults resulted from spawn take operation.

- **Provide projected annual take levels for listed species by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**
None

Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.
NA

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe the proposed plans and methods necessary to respond to the appropriate "Performance Indicators" that have been identified for the program.

The offsite lakes program is monitored by the responsible management agencies (MDFWP and CSKT) through periodic gill net surveys, angler interviews and the annual statewide angler creel census. Stocking rates are established to a large degree by trial and error. Gill netting provides data on species relative abundance, growth rates and fish condition factor. Angler surveys are qualitative indicators of catch rates, angler satisfaction and rough estimates of harvest.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

The USFWS is not directly involved in monitoring the offsite lakes stocking program. Monitoring is performed by the agencies responsible for management of the waters. They are Montana Fish, Wildlife, and Parks Dept. for state waters in the portion of the Flathead drainage above Flathead Lake; and the Confederated Salish and Kootenai Tribes for waters within the Flathead Indian Reservation (below Flathead Lake). These agencies receive sufficient funding through this process to implement monitoring programs on these stocked waters.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed species resulting from monitoring and evaluation activities.

None of the waters stocked under this mitigation program contain self-sustaining natural populations of listed and/or native fishes. Therefore, monitoring activities conducted on these waters do not genetically or ecologically impact those species.

SECTION 12. RESEARCH

Provide the following information for any research programs conducted in direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in Table 1.

12.1) Objective or purpose.

Purpose was to develop fish culture techniques for bull trout, (feeding methods, diets, cover requirements, etc.) in the event it becomes desirable or necessary in the future to artificially rear bull trout for restoration or refugia purposes.

Currently, eggs produced from the broodstock established from the 1993 wild egg take have been used in a variety of research endeavors, such as; a 3 yr. blood hormone bioassay; hybridization experiments with dolly varden; susceptibility to whirling disease; sensitivity to heavy metals, dioxins, and PCB; screening criteria for bull trout; and optimal and lethal thermal criteria for growth and survival; and preserved reference sets of early life stages for field identification use. This information will greatly aid in the recovery efforts of this listed species.

12.2) Cooperating and funding agencies.

Funding for this project provided by the BPA through the Hungry Horse Fisheries Mitigation Plan.

Agencies utilizing our bull trout in their research has included the Oregon DFW; Univ. of B.C.; Univ. of Wyo.; Montana DFWP; USEPA-Duluth; and the USFWS's Bozeman and Abernathy Fish Tech Centers.

12.3) Principle investigator or project supervisor and staff.

Wade Fredenburg and Don Edsall of the USFWS Creston Fish & Wildlife Center oversee fish cultural observations at the Creston Hatchery.

12.4) Status of population, particularly the group affected by project, if different than the population(s) described in Section 2.

NA

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

NA

12.6) Dates or time period in which research activity occurs.

Yearlong with hatchery produced fish.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

NA

12.8) Expected type and effects of take and potential for injury or mortality.
NA

12.9) Level of take of listed species: number or range of individuals handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).
None under current program.

12.10) Alternative methods to achieve project objectives.
NA

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.
None

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed species as a result of the proposed research activities.
NA

SECTION 13. ATTACHMENTS AND CITATIONS

Include all references cited in the HGMP. In particular, indicate hatchery databases used to provide data for each section. Include electronic links to the hatchery databases used (if feasible), or to the staff person responsible for maintaining the hatchery database referenced (indicate email address). Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, benefit/risk assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 1. Estimated listed species take levels by hatchery activity.

Listed species affected: _____ ESU/Population:_____ Activity:_____				
Location of hatchery activity:_____ Dates of activity:_____ Hatchery program operator:_____				
Type of Take	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
	Egg/Fry	Juvenile/ Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.