2009-2011 Summary
Boise NF Aquatic Management Indicator Species (MIS) Monitoring

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Introduction

In order to evaluate the effects of management practices on fisheries and wildlife resources, the U.S. Forest Service monitors select species whose population trends are believed to reflect the effects of management activities on Forest ecosystems. These species are termed "management indicator species" (MIS) and the rationale for MIS monitoring is outlined in federal regulation 36 CFR 219.19.

> *"In order to estimate the effects of each alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities."*
>
> *"Population trends of the management indicator species will be monitored and relationships to habitat changes determined."*

An important criterion integral to the MIS foundation is that monitoring results must allow managers to answer questions about population trends. Historically, monitoring of habitat was used a surrogate for direct quantification of MIS populations. However, recent court cases (*Sierra Club v. Martin*, 168 F.3d 1 (11^{th} Cir. 1999)) have ruled that assessing changes in habitat will no longer be accepted as a substitute for direct monitoring of populations. The Forest Service has an obligation to collect and analyze quantitative population trend data at both the forest-plan and project level.

In response to issues raised by court challenges, the Sawtooth, Boise, and Payette National Forests revisited aquatic MIS species for the Draft Forest Plan EIS to determine if the population data were sufficient to determine trend at the Forest scale.

Following this reevaluation, bull trout was selected as the aquatic MIS species (for a full explanation of the MIS review, see Aquatic Management Indicator Species for the Boise, Payette, and Sawtooth Forest Plan Revision, 2003). Bull trout were selected because the species is sensitive to habitat changes, dependent upon habitat conditions that are important to many aquatic organisms, relatively well understood by Forest biologists, and widely distributed across the Ecogroup. In addition, local bull trout populations are not influenced by stocking and likely persist at relatively small spatial scales that do not extend beyond Forest boundaries. As a result, Forest bull trout populations are probably not heavily influenced by activities occurring outside Forest domains, and therefore changes in bull trout populations will more likely reflect local management activities.

Methods

Development of MIS Sampling Protocol for Bull Trout

An approach to monitoring MIS bull trout was developed with the Boise National Forest, Regional Office, and the Boise Rocky Mountain Research Station in 2004. The following provides a summary of this monitoring approach.

A key question that this approach addresses is how does one monitor trend? For aquatic species, trend is typically monitored using relative abundance estimates over time in a select set of streams. However, the challenge with abundance data is that it is often influenced by sampling error and natural variation (Platts and Nelson 1988; Maxell 1999; Dunham et al. 2001).

Given these well-known limitations, an alternative population trend monitoring approach was developed that focuses on monitoring the spatial patterns of occurrence (distribution) through time. Monitoring distributions can be particularly appropriate for bull trout because it has specific habitat requirements. Bull trout distributions are limited to cold water (Dunham et al. 2003), and suitably cold habitats are often patchily distributed throughout river networks (Poole et al. 2001). Dunham and Rieman (1999) found that bull trout populations in the Boise River basin were linked closely to available habitat "patches" or networks of cold water. A patch is defined for bull trout as the contiguous stream areas believed suitable for spawning and rearing (Rieman and McIntyre, 1995). Rieman and McIntyre (1995) analyzed bull trout in the Boise River basin and found occurrence to be positively related to habitat size (stream width) and patch (stream catchment) area, as well as patch isolation and indices of watershed disruption. Patch size (area) was the single most important factor determining bull trout occurrence.

Spatial patterns can also provide information on population persistence, local extirpations, and recovery (recolonization). The stability and persistence of metapopulations are related to the number, size, degree of isolation, and relative distribution of populations (Dunham and Rieman 1999). Bull trout populations in larger, less isolated, and less disturbed habitats appear more likely to persist over time.

Based upon the above approach the following metrics for determining trend were used:

(1) The proportion of habitat patches that bull trout occupy within each subbasin across time.
(2) The spatial pattern of occupied bull trout patches within each subbasin across time.

It was assumed in the forest plans that as restoration and conservation activities are implemented, constraints on watershed processes and habitat condition would be reduced. This in turn would maintain or restore properly functioning subwatersheds and slowly improve degraded subwatersheds. However, it was also realized that it would take time for populations to respond to restoration and conservation measures. This might be particularly true for bull trout, which have a relatively long generation time (5-10 years). Therefore, it was assumed that the number and distribution of strong or depressed bull trout populations would change relatively slowly over the 15 years of the forest plan.

We anticipate that important changes in the distribution and proportion of occupied bull trout patches will only be apparent over time scales approximating the life of the forest plan. Bull trout may become more widely distributed in occupied patches as populations begin to expand, and recolonization of unoccupied patches may occur as barriers are removed. However, only with sustained restoration and sufficient time for natural recovery, are we likely to see substantial changes in the portion of occupied patches or increases in bull trout distributions within occupied patches.

The trend of occupied patches and spatial pattern will not explain why changes have occurred. As the CFR states, "Population trends of the management indicator species will be monitored and relationships to habitat changes determined." Therefore, an approach is currently being developed to tie MIS monitoring with forest plan implementation and effectiveness monitoring to determine how habitats and individual populations change in relation to management activities.

Initial Determination of Bull Trout Patches

Bull trout patches were identified in two ways. First, several subbasins (e.g. Boise and Payette) already had patches delineated by existing work following Rieman and McIntyre (1995) and Dunham and Rieman (1999). For these subbasins, district and forest biologists reviewed patch designations to determine if they included all known or potential streams that could support bull trout. Second, for subbasins where patches had not been established, a consistent set of criteria was applied to delineate patches.
Forests used criteria similar to those used by the RMRS in the Boise and Payette subbasins. Patches were initially defined based on major physical gradients (patch size, as it related to stream size and elevation). Patches were identified as catchments above 1600 m and were delineated from U.S. Geological Survey 10m Digital Elevation Models (DEM). The 1600 m elevation criteria was used because data from the Boise basin indicated that the frequency of juvenile bull trout (<150 mm) occurrence increased sharply at about 1,600 m (Rieman and McIntyre 1995; Dunham and Rieman 1999).

Subwatersheds that were above 1600 m, but less than 500 hectares, were not included because they rarely supported perennial streams large enough to support bull trout. Watson and Hillman (1997) only found bull trout in streams greater than two meters in width and studies in western Montana (Rich 1996) and southwest Idaho (Rieman and McIntyre 1995; Dunham and Rieman 1999) show bull trout are less likely to occur in streams less than two meters in width. We assumed that patches less than 500 hectares would have streams with a wetted width smaller than 2 m at 1600m in elevation.

We initially assumed that 1,600 m elevation approximated the lower limits of habitat suitable for spawning and early rearing of bull trout. Because of the association with temperature, elevation should define habitat patches that are at least partially isolated by distance across warmer waters (Rieman and McIntyre, 1995). The 1600m elevation in the Boise and Payette subbasins currently forms the downstream boundary of each patch. However, in subbasins in higher latitudes, there may not be a clear elevation threshold. Therefore, further verification described below was completed.

Once delineated, district and forest biologists reviewed patch designations and made refinements based on stream temperature and presence of bull trout smaller than 150mm. Patches were defined as areas generally not isolated from the larger subbasin by a yearlong barrier (physical, chemical, etc.) to fish movements and by water temperatures no higher than 15 °C (7-day average summer maximum).Recent analysis of stream temperatures and bull trout occurrence indicates juvenile bull trout are unlikely to be found in stream sites with maximum summer temperatures of 18-19 °C (Dunham et al. 2003).

Observations used to define patch boundaries were also based on the more restricted movements of small (less than 150 mm) bull trout. Although some bull trout may exhibit seasonal movements from natal habitats to wintering or foraging areas (e.g. larger rivers, lakes or reservoirs), fidelity to the natal environments is likely during spawning and initial rearing. Because spawning salmonids home to natal streams and even reaches (Quinn 1993), occupied patches separated by thermally unsuitable habitat are likely to represent populations with some reproductive isolation. Other information (e.g. genetic, mark-recapture, radio-telemetry, etc.) may be collected over time to determine distinctiveness of the populations associated with the patches we define.

Classification of Patches and Stratification of Sampling

Once bull trout patches were identified, they were classified into four categories to further focus sampling efforts over the life of the forest plan (2003 – 2018). These categories included: (1) patches known to support a bull trout population (i.e., spawning and/or early rearing has been documented) as indicated by past surveys (within the last 7 years); (2) patches that have been surveyed and baseline conditions likely will support a bull trout population, but they have not been detected or patches where bull trout have been detected, but observations are older than 7 years; (3) patches that have been surveyed and baseline conditions (i.e., stream temperature, etc.) likely will not support a bull trout population and bull trout have not been detected (i.e. we assume these patches are unsuitable and unoccupied); and (4) patches that have not been surveyed.

There are 179 bull trout patches that occur within three basins (nine subbasins) on the Boise National Forest.

Changes to Bull Trout Patches

Expansion, contraction, or shifting distributions of bull trout within patches are likely to be influenced by changing environmental conditions. Water temperature is one of the most significant habitat parameters for bull trout and therefore will be important when evaluating patch boundaries over time. All patches falling into category 1, 2, or 4 will be sampled for bull trout at least twice over the life of the forest plan (e.g. at least once within the first and second 7-year periods). In the year prior to sampling of a patch, at least one thermograph will be installed at the downstream patch boundary and at several other points upstream.

Annual temperature monitoring will also be conducted within specific patches in each category (e.g. 1, 2, and 3) over the life of the forest plan. With this information we can examine natural variation in stream temperatures, evaluate whether patch boundaries should be changed (e.g. elevated temperature due to an unusually hot summer) based on one year's monitoring, and determine if temperatures in select category 3 patches are improving enough to justify future sampling for bull trout.

The thermograph data will also help us evaluate whether a patch is still suitable for bull trout (i.e., whether a Category 1, 2, or 4 patch is actually Category 3 or whether the downstream (temperature-based) boundary of the patch is pushed upstream so far as to eliminate [because of the area criterion] the subject drainage from consideration as a patch). Thermograph data may also be used to determine if conditions within selected Category 3 patches have improved enough that the patch category needs to be redefined to a 2.

Patch Sampling Frequency

How frequently a patch is sampled is dependent upon how many patches fall within each stratum and if some patches require more intensive sampling to establish presence or absence to the level of detection allowed by the methodology. All patches that fall within categories 1, 2 and 4 will be sampled at least twice over the life to the forest plan (2003 – 2018), while patches that fall within stratum 3 will be sampled at least once.

Within the first half of the forest plan (0-7 years), all patches in strata 1, 2 and 4 would be prioritized for inventory. Patches in category 1 would be sampled no later than 7 years from the last documented bull trout observation. For example, if bull trout were last documented in 1999, then the patch would need to be sampled again no later than 2006. Patches within strata 2 and 4 would also be surveyed to help establish bull trout presence or absence to the level of certainty allowed by the methodology.

Depending on the survey results, patches may be reclassified. For example, once all patches in stratum 4 are surveyed, they would be reclassified (e.g. 1, 2, or 3). Likewise, if no bull trout were found where previously observed (category 1 patch), it would be reclassified. If bull trout were still present then the patch would remain in category 1.

In the second half (8-15 years) of the forest plan, all patches in strata 1 and 2 would be sampled. Patches in stratum 3 (degraded baselines with high stream temperatures, high amount of fine sediment, etc.) would only be sampled if environmental conditions or limiting factors (e.g. culvert barrier removed) improved, increasing the likelihood that the patch might support bull trout or if a neighboring patch were colonized by bull trout.

Informal and Formal Surveys

To maximize effort and facilitate fieldwork, we plan to use a combination of informal and formal surveys. Informal surveys may use any fish sampling method, but if informal surveys fail to detect bull trout, formal surveys must be completed. Formal surveys will follow a consistent protocol, sampling intensity, sampling effort, etc. designed to estimate the probability that bull trout actually occur in a site or patch given that they are not detected (i.e. a false absence).

The sample design (delineation of patches and sample sites within patches) attempts to focus on habitat that has the highest probability of supporting bull trout. While this design increases the probability of detecting bull trout, it does not guarantee it. Determination of bull trout presence is certain only when a bull trout is detected or captured (Peterson and Dunham 2002). Absence can never be certain (unless perhaps the stream is dewatered). Many patches within the Boise and Sawtooth National Forests are either believed to be unoccupied or have very low bull trout densities. If a species is not detected, then either it is truly absent or it is present but not detected during the survey. The goal is to sample in a way that allows the estimation of the probability of presence or absence in a patch given sampling effort and site characteristics that will influence the probability of detection when bull trout are actually present.

The general methods outlined by Peterson et al. (2002) or their extension by Peterson and Dunham (2003) will be used to estimate probability of bull trout presence in sampled patches. The probability of bull trout detection for each site will be estimated from Appendix 1, Table 3, in Peterson et al. 2002 or with empirical methods as discussed by Wintle et al. 2004. This protocol provides forest biologists with a pseudo-quantitative measure assessing the likelihood that sampling efforts were intensive enough to detect bull trout, assuming that they are present in the patch. If habitat conditions in a patch are known, biologists can determine the extent of sampling required to reach a predetermined level of confidence that bull trout are not present. In addition, calculating probabilities of detection following sampling efforts helps biologist to determine whether future sampling is necessary.

Selecting Sites within Patches

To focus sampling within a patch, only suitable habitat will be inventoried. Suitable habitat is defined according to wetted width (greater than 2 meters), stream gradient (less than 20%), water temperatures (15 °C or less, 7-day average summer maximum), and access (no natural or anthropogenic barriers). All suitable habitats in each patch that meet these criteria will be identified prior to surveying. For formal surveys, sites within each patch will be located by randomly selecting elevations within the extent of the suitable habitat. Randomizing sample sites within a patch will allow us to make conditioned inferences to all perennial streams greater than 2 meters within the patch.

Sampling within each site

Informal surveys will be done in all stratum 1 patches where bull trout have been found in the past; if bull trout are not found, formal surveys will be done. Formal sampling will be based on a standardized electrofishing method selected to maximize the probability of detection within a patch by balancing the effort within a site against the number of sites within a patch. The minimum formal sampling will consist of a 100m double-pass transect with blocknets. Additional electrofishing passes can be completed if an index of abundance, sampling efficiency data, or other information is desired. If juvenile bull trout (i.e., less than 150 mm) are found within any site, bull trout will be declared present within that patch. If bull trout are not detected in the first sample site, additional sites will be sampled in each patch until bull trout are detected, until a desired probability of detection in the patch is reached, or until maximum allowable effort given logistical constraints is reached, which ever occurs first. Additional sites can also be surveyed to describe distribution within a patch.

Sampling sites within a patch will be no less than 100 m in length. In models used by the Rocky Mountain Research Station, 100m transects had slightly higher densities of bull trout; thus, detectability of bull trout is greater, assuming equal sampling efficiencies.

Results and Discussion

Summary

Summary data is provided in tables appended to this document.

As of 2009, all patches originally designated on the Boise NF as “strata 4” (unsurveyed) have either been sampled with electrofishing or with thermographs.

Of the 179 patches on the Boise NF, as of the completion of the 2011 field season, 60 patches are designated “strata 1” (occupied by juvenile bull trout, based on electrofishing), 65 patches are “strata 2” (suitable habitat, but unoccupied by juvenile bull trout, based on electrofishing), and 53 patches are “strata 3” (unsuitable habitat, primarily due to temperature).

Bull trout monitoring (electrofishing) was completed for 19 patches in 2009, 15 patches in 2010, and 16 patches in 2011.

Of the 23 “strata 1” patches (occupied by juvenile bull trout) sampled in the three years, juvenile bull trout <150mm were found again in 22 patches. These patches therefore retained their “occupied” status. Juvenile bull trout were not detected in two “strata 1” patches in 2011 (Rammage Creek and Parks Creek patches) therefore their status dropped from “strata 1” to “strata 2”.

Of the 19 “strata 2” patches (unoccupied by juvenile bull trout) sampled in the three years, juvenile bull trout were found in two patches (Bald Mtn. and Caton).

Of the 6 “strata 3” patches (unsuitable for or inaccessible to bull trout) sampled in the three years, bull trout were not detected in any.

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Table 1. Comparison of bull trout patch strata 2003-2011.

Strata	2003	2004	2005	2006	2007	2008	2009/2010	2011
1 – Occupied	47	N/A	56	56	59	60	63	60
2 – Suitable/Unoccupied	64	N/A	62	59	59	63	62	65
3 – Unsuitable/Inaccessible	17	N/A	19	22	37	50	54	54
4 - Unsurveyed	50	N/A	42	41	24	6	0	0

Table 2. Bull Trout Detection from Sampling 2009-2011.

Subbasin	Patch	Strata Designation in 2008	Year Sampled	Juvenile Bull Trout Detected	Adult Bull Trout Detected
MFS	Bear Valley	1	2009	+	+
NFB	Big Owl	2	2009	-	-
MFB	Black Warrior Creek	1	2009	+	+
MFP	Bulldog Creek	4	2009	-	-
SFP	Bush Creek	3	2009	-	-
SFB	Cayuse Creek	2	2009	-	-
SFS	EF Burntlog-Buck	1	2009	+	+
SFB	Green Creek	2	2009	-	-
SFB	Grouse Creek	2	2009	-	-
SFB	Lincoln Creek	2	2009	-	-
NFB	Lodgepole Creek	1	2009	+	+
SFP	Sams Creek	4	2009	-	-
SFP	Trail Creek	1	2009	+	+
SFP	Upper Deadwood	1	2009	+	+
MFP	Valley Creek	2	2009	-	-
SFB	Wide West Gulch	2	2009	-	-
SFP	Wilson Creek	2	2009	-	+
SFP	Wolf Creek	2	2009	-	-
MFS	Wyoming Creek	1	2009	+	+
MFB	Bald Mtn Creek	2	2010	+	+
SFB	Bear Creek SFB	3	2010	-	-
SFP	Bear Creek SFP	2	2010	-	-
SFS	Caton Creek	2	2010	+	+
SFP	Deadwood Reservoir	1	2010	+	+
SFP	Deer Creek	1	2010	+	+

SFS	Dollar Creek	2	2010	-	+
SFP	Fivemile Creek	2	2010	-	-
SFP	Ninemile Creek	2	2010	-	-
Payette	Renwyck Creek	1	2010	+	+
SFP	Scott Creek	1	2010	+	+
SFP	SF Scott Creek	1	2010	+	+
MFS	Sulphur Creek	2	2010	-	-
MFP	Upper MFK Boise	2	2010	-	-
SFP	Warm Springs	1	2010	+	+
	Big Spruce Creek		2011	-	+
	Buck Creek	1	2011	+	+
	Casner Creek	3	2011	-	-
	Chapman Creek	1	2011	+	+
	Clear Creek	1	2011	+	+
	Cook Creek	1	2011	+	+
	Cottonwood Creek	2	2011	-	-
	Gates Creek	1	2011	+	+
	Grimes Creek	3	2011	-	-
	Johnson Creek	1	2011	+	+
	Little Silver Creek	3	2011	-	+
	Loosum Creek	3	2011	-	-
	Mormon Creek		2011	-	+
	No Man Creek	2	2011	-	-
	Parks Creek	1	2011	-	
	Rainbow Creek		2011	+	+
	Rammage Meadows	1	2011	-	-
	Renwyck Creek	1	2011	+	+
	Wapiti	1	2011	+	+

Table 3. Number of bull trout patches on the Boise National Forest and the number surveyed in 2009 and 2010 within each subbasin by strata. The percent of patches that have been surveyed are displayed in parentheses (2011 TBD).

Stratum	**S.F. Boise Subbasin**		**N.F. and M.F. Boise Subbasin**		**Boise Mores Subbasin**		**Boise Basin Total**	
	Patches	Surveyed	Patches	Surveyed	Patches	Surveyed	Patches	Surveyed
1	4	4 (100%)	14	14(100%)	1	1 (100%)	19	19(100%)
2	13	12 (92%)	18	15 (83%)	6	5 (83%)	37	32 (86%)
3	10	1 (10%)	13	8 (62%)	7	5 (71%)	30	14 (46%)
4	0	0	0	0	0	0	0	0
Total	**27**	17 (62%)	**45**	37 (82%)	**14**	11 (79%)	**86**	65 (76%)

Stratum	**S.F. Payette Subbasin**		**Middle Fork Payette Subbasin**		**Payette (Squaw Creek) Subbasin**		**North Fork Payette Subbasin**		**Payette Basin Total**	
	Patches	Surveyed	Patches	Surveyed	Patches	Surveyed	Patches	Surveyed	Patches	Surveyed
1	16	16(100%)	3	3(100%)	4	1 (100%)	1	1 (100%)	24	24(100%)
2	17	15 (88%)	3	3(100%)	0	0	0	0	20	18 (90%)
3	7	4 (57%)	**6**	6(100%)	1	1 (100%)	0	0	14	11 (79%)
4	1	0	1	0	0	0	0	0	2	0
Total	**40**	35 (87%)	**12**	12(100%)	**5**	5 (100%)	**1**	1 (100%)	**58**	9 (90%)

Table 3. (cont.)

Stratum	**South Fork Salmon Subbasin**		**Middle Fork Salmon Subbasin**		**Salmon Basin Total**	
	Patches	Surveyed	Patches	Surveyed	Patches	Surveyed
1	11	11(100%)	9	9 (100%)	20	20(100%)
2	4	4 (100%)	1	1 (100%)	5	5 (100%)
3	9	4 (44%)	1	0 (0%)	10	4 (40%)
4	0	0	0	0	0	0
Total	**24**	19 (79%)	**11**	10(91%)	**35**	29 (83%)

Table 4. Summary of results from 2009-2010 aquatic MIS sampling on the Boise National Forest (2011 TBD).

Subbasin	Patch Name	Category (2010)	Patch Size (ha)	Sampling Method (#of sites)	Bull Trout Detected	Probability of Occupancy Given No Detection*	# Sites with Bull Trout < 150mm	Electrofish Site when Bull Trout were First Detected	Electrofish Pass when Bull Trout were First Detected
MFS	Sulphur Creek	2	6131	Depletion	No	?	0	-	-
MFS	Bear Valley	1	2058	Depletion (2)	Yes	N/A	1	2	1
NFB	Big Owl Creek	2	839	Depletion (2)	No	19%	0	-	-
MFB	Black Warrior Creek	1	3103	Depletion (2)	Yes	N/A	1	1	1
MFB	Lodgepole Creek	1	817	Depletion (2)	Yes	N/A	1	1	1
MFB	Bald Mtn Creek	1	2058	Depletion (1)	Yes	N/A	1	1	1
SFB	Cayuse Creek	2	1870	1-pass (2)	No	30%**	0	-	-
SFB	Green Creek	2	563	Depletion (2)	No	N/A	0	-	-
SFB	Grouse Creek	2	3497	Depletion (2)	No	33%**	0	-	-
SFB	Lincoln Creek	2	688	1-pass (1)	No	N/A	0	-	-
SFB	Wide West Gulch	2	560	1-pass (1)	No	N/A	0	-	-
SFP	Deadwood Reservoir	1	13040	Depletion (2)	Yes	N/A	1	1	1
SFP	Bush Creek	3	507	1-pass (1)	No	**	0	-	-
SFP	Sam's Creek	2	580	Depletion (2)	No	19%	0	-	-
SFP	Trail Creek	1	2032	Depletion (2)	Yes	N/A	1	1	1
SFP	Warm Springs	1	4276	1-pass (1)	Yes	**	1	1	1

SFP	Wolf Creek	2	1268	Depletion (2)	No	19%	0	-	-
SFP	Fivemile Creek	2	1814	Depletion (3)	No	19%**	0	-	-
PAY	Renwyck Creek	1	1072	Depletion (1)	Yes	N/A	1	1	2
MFP	Bulldog Creek	3	989	Depletion (1)	No	N/A	0	-	-
MFP	Valley Creek	2	1305	Depletion (2)	No	19%	0	-	-
SFS	Caton Creek	1	7018	Depletion (1)	Yes	N/A	1	1	1
SFS	Dollar Creek	1	2318	Depletion (1)	Yes	33%	0	1	1
SFS	Burntlog Creek	1			Yes		1		

Note: Probability of detection calculated from Petersen et al. (2002). * Probabilities of detection were calculated only when bull trout were not found. ** Natural barriers were identified. N/A - Bull trout were found so a probability of detection is not needed.

Table 5. Fish species detected during 2009-2010 MIS sampling on the Boise N.F. (2011 TBD)

		Species Observed						
Subbasin	**Patch**	**Bull Trout**	**Brook Trout**	**Rainbow Trout**	**Westslope Cutthroat Trout**	**Chinook Salmon**	**Sculpin**	**Whitefish**
North Fork Boise	Big Owl Creek			+				
Middle Fork Boise	Lodgepole Creek	+						
Middle Fork Boise	Black Warrior Creek	+						
Middle Fork Boise	Bald Mountain	+		+				
Middle Fork Boise	Upper Middle Fork Boise		+	+			+	
South Fork Boise	Green Creek			+				
South Fork Boise	Grouse Creek			+				
South Fork Boise	Lincoln Creek			+				
South Fork Boise	Wide West Gulch			+				
South Fork Boise	Cayuse Creek			+				
South Fork Salmon	Caton Creek	+		+				
South Fork Salmon	Dollar Creek		+	+	+			
South Fork Salmon	Burntlog Creek	+						
Middle Fork Salmon	Sulphur Creek			+	+		+	
Middle Fork Salmon	Bear Valley Creek	+	+				+	

South Fork Payette	Fivemile Creek			+			+	+
South Fork Payette	Deadwood Reservoir	+						
South Fork Payette	Bush Creek							
South Fork Payette	Sam's Creek			+				
South Fork Payette	Trail Creek	+		+				
South Fork Payette	Warmsprings Creek	+		+				
South Fork Payette	Wolf Creek			+				
Middle Fork Payette	Bulldog Creek							
Middle Fork Payette	Valley Creek			+				
Payette Squaw	Renwyck Creek	+		+				