APPENDIX D - REVISED

BIOLOGICAL EVALUATION OF THREATENED, ENDANGERED, AND SENSITIVE AQUATIC SPECIES

Bull trout is the only federally listed aquatic species that occurs on the BDNF. Effects from the Revised Plan are presented in a Biological Assessment, as part of the consultation process with the USFWS, required by the Endangered Species Act.

The Regional Forester identified arctic grayling, westslope cutthroat trout, northern leopard frog and western toad for Region 1 of the USDA Forest Service, as sensitive on the BDNF. Sensitive species, as defined by the Forest Service, are species known to occur on National Forests, for which population viability is a concern, as evidenced by significant current or predicted declines in population numbers or density, or significant current or predicted declines in habitat capability that would reduce a species existing distribution. These species also meet the criteria (ABI/Heritage G ranks of 1-3) suggested by Andelman et al. (2001). They recommended the ABI/Heritage rankings, because they explicitly deal with the severity, scope, and imminence of threats, and because they already exist for almost all species on Forest Service lands.

If determinations within this Biological Evaluation indicate there is no threat to viability for these species, it is assumed there should be no imminent viability threat to other aquatic species on the Forest. Habitat for other aquatic species will be adequately provided because, needs of the species analyzed, broadly encompass the primary habitat attributes necessary for persistence of other aquatic species.

This analysis considers how the Revised Forest Plan influences the primary threats to viability for the species listed above. Each threat is evaluated relative to the influence it currently has on risk and the influence it is projected to have once the Revised Plan is implemented. Expected changes in risk are then related to viability.

The Aquatic Resources Management Strategy in Preferred Alternative 6 consists of four primary elements developed to help maintain species viability across the planning unit.

- Designation of 57 fish key watersheds, allocated specifically for protection and conservation of some of the strongest WCT and Bull trout populations distributed forestwide;
- Designation of 15 restoration key watersheds to emphasize an aggressive program for aquatic restoration at watershed scales;
- Implementation of a riparian conservation strategy (INFISH modified), incorporated as a base level of protection for all aquatic resources forestwide. Modifications help clarify the intent of INFISH, facilitate consistent application, reduce conflicts with recent policy and regulation decisions, and customize resource management objectives to improve applicability to stream systems east of the continental divide and,

- Requirement for the reduction of the risk of aquatic nuisance species (ANS) introduction from new management actions.

These four elements are supplemented with additional direction for managing aquatic resources that are fundamental to broader aquatic objectives. These also will contribute to conservation of species on the Forest.

POPULATION CHARACTERISTICS IMPORTANT TO VIABILITY

Rieman et al. (1993) listed 4 primary population characteristics that are influential in a population's viability. They are: Temporal variability in recruitment or survival; Growth and Survival; Population size; and Isolation.

Temporal variability in recruitment or survival refers to annual fluctuations in population numbers. When recruitment and survival rates fluctuate broadly from year to year it often suggests a population has little ability to buffer effects of annual environmental variations. High temporal variability can result from; and be reflected in "year class failures" (Rieman et al. 1993), when spawning and reproduction, fail to supplement the population.

For many populations we don't have the data to determine if temporal variability represents a risk, so surrogate indicators are used. If a population is restricted to a small area, the survival of young individuals is more likely to reflect annual environmental differences or localized disturbances. Shepard et al. (2005) used the length of stream occupied by individual populations of WCT to display confinement and connectedness of habitat (ability to migrate) as an indicator of temporal variability risk. Loss of habitat complexity is also influences temporal variability because the habitat is less capable of buffering effects of environmental perturbations. Habitat complexity can and should be considered at the watershed and occupied reach scales.

Growth and survival is another important population characteristic. Since, determining population growth and survival rates can be cost-, or time-prohibitive, they have been described relative to habitat condition and population trend (Rieman et al. 1993, Shepard et al. 2005). Declines in growth and survival often occur because the capacity of the habitat is changing in a way that is counter-productive for the species, preventing it from supporting as many individuals. Non-native species influences (predation, hybridization and competition) can be detrimental. Also mortality to individuals from management actions (harvest), natural environmental disturbances (prolonged drought) or disease, sometimes cause problems. If growth and survival are significantly impaired, the population trend will be negative. If a negative trend is maintained over a long time frame the risk of extinction increases.

Rieman et al. (1993) considers population size separately from other population characteristics. This analysis does the same. Population size is most often controlled by the amount of habitat available and the quality of the habitat. Population size, when considered in the context of viability, often refers to the number of breeding adults in a population. If population numbers become very low, the value of each individual (and its capacity to

reproduce) increases. If reproduction and recruitment fail to compensate for mortality rates that commonly occur, extinction becomes more probable. In very small populations, there can also be genetic consequences which can threaten viability.

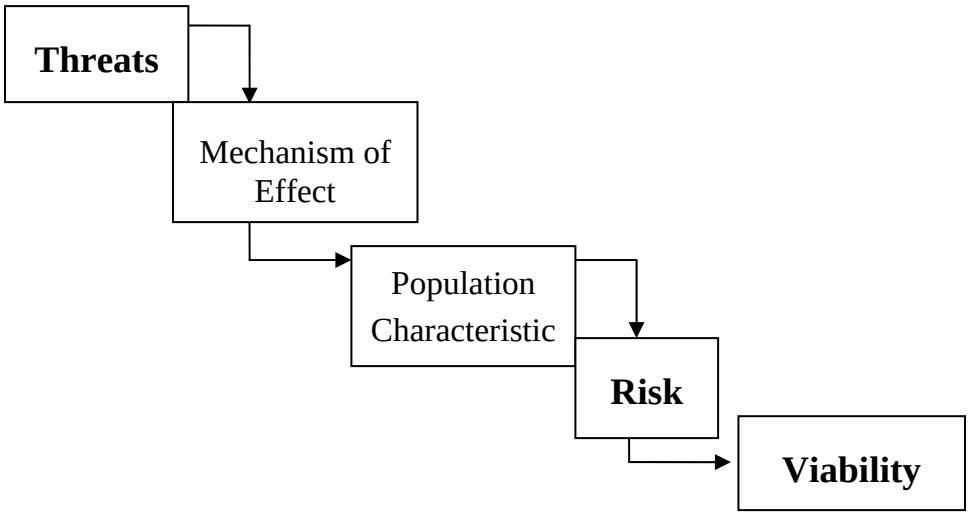
Isolation refers to a lack of capability for populations to interact and exchange individuals. It increases the risk of extinction through deleterious genetic influences or localized environmental disturbances. Connectivity, the opposite of isolation, helps maintain genetic variability through the exchange of individuals. It also allows populations that become decimated from catastrophic events to naturally reestablish themselves. Rieman et al. (1993) assessed isolation based on the proximity of neighboring populations; whether migratory corridors are available; and/or whether migratory life histories are present.

RISKS AND THREATS TO POPULATIONS

Risks are changes in the population characteristics, which could threaten a population's persistence. This biological evaluation considers the Revised Forest Plan's influence on the following risks:

- High temporal variability in recruitment and survival
- Declining population trend
- Small population size.
- Population Isolation

Threats include management actions or events that cause and/or exacerbate risks. "Mechanisms of affect" are the avenues through which threats influence risks. The diagram below displays the relationship of threats, risks, and population viability.



Determinations regarding viability in this analysis are based on the extent to which direction in preferred Alternative 6 in the Revised Plan influences risks for the species analyzed. The relationships presented in Table 1 are fundamental to this analysis because threats (i.e. management actions) tend to work through the "mechanisms of affect" to influence risk. If the Revised Plan adequately prevents significant occurrence of the "mechanisms of affect," it

is assumed requirements for viability will be met. If not, the level of risk to populations and the Forest's management contributions to those risks, will be discussed relative to maintaining viability across the planning unit.

Table 1. The relationships between population characteristics described above, mechanisms that negatively affect them, and the resulting risks.

POPULATION CHARACTERISTIC	MECHANISM OF AFFECT	RISK
Temporal Variability	Decrease in habitat complexity; Decrease in the habitat occupied	Highly Variable Recruitment or Survival
Growth and Survival	Decrease in habitat condition; mortality/loss of individuals	Declining Population Trend
Population Size	Decrease in available habitat; Decrease in habitat condition;	Depressed or Small Population Size
Isolation	Decrease in distribution; Loss of connected habitats, resulting in fragmentation	Population is Isolated

SPECIES INFORMATION

Northern Leopard Frog

Habitat Requirements of the Leopard Frog

Northern leopard frogs tend to use low elevation, permanent, slow-moving or standing water bodies with considerable vegetation, wet sedge-meadows, cattail meadows, springs, and beaver ponds in streams as habitat (Reichel & Flath 1995, Maxell 2000). They usually breed in ponds or lake edges with dense aquatic vegetation. Adults are usually found in riparian habitats or on prairies near permanent waters (summarized by Maxell 2000). Adults feed on invertebrates, but may cannibalize smaller individuals. Northern leopard frogs over-winter burrowed into lake or pond bottoms, beneath substrate in streams, or in underground crevices that do not freeze (Maxell 2000).

Life History of the Leopard Frog

Northern leopard frogs breed in April and May when rain and day-time air temperatures are in the 60's. Cooler temperatures or a lack of rain may delay breeding by a few weeks. Eggs hatch in 5 to 20 days and tadpoles metamorphose 8 -15 weeks after hatching. Sexual maturity

is reached 2 to 4 years after metamorphosis. Adults will live up to 4 years after achieving maturity (Werner et al. 2004)

Leopard Frog Status

The northern leopard frog historically ranged from Newfoundland and northern Alberta in the north to the Great Lakes region, the desert Southwest and the Great Basin in the south (Maxell 2000). In Montana they have been documented across the eastern plains and in many of the mountain valleys on both sides of the Continental Divide at elevations up to 6,000 feet. Over the last few decades the leopard frog has undergone declines across much of the western portion of their range (Stebbins & Cohen 1995 as cited by Maxell 2000). Most northern leopard frogs in western Montana disappeared in the 1970s or early 1980s. The only 2 population centers known to exist in western Montana are near Kalispell and Eureka (Maxell 2000). Its disappearance may be related to a disease such as chytrid fungus or to a combination of disease and undetermined environmental factors.

Leopard Frog Status Forestwide

The northern leopard does not currently exist on BDNF lands. The Montana Natural Heritage Program does not list any portion of the Forest as currently within its “range of distribution”. Higher elevations common to BDNF lands naturally limit this species occurrence. None-the-less, the structural components of habitats suitable for all live stages are broadly distributed forest-wide and aquatic management direction in the revised Plan should ensure riparian areas are maintained in – and restored to conditions that favor leopard frogs and other amphibian species. Thus, management on BDNF lands should not restrict expansion of this species should recent trends in populations become reversed.

First and foremost, since leopard frogs do not exist on or around BDNF lands, coupled with the fact that higher elevations common to BDNF lands - has always - and will continue to limit this species occurrence; and because habitat is currently available and in good condtion, and all riparian areas will be managed for favorable conditions under the revised Plan,

My determination for the leopard frog, relative to management direction in Alternative 6 of the Revised Forest Plan is: No Impact

Western Toad

Habitat Requirements of the Western Toad

Adult boreal toads reside in a wide range of habitats including wetlands, forests, woodlands, sagebrush, meadows, and floodplains (Maxell 2000). Adults feed on a variety of ground dwelling invertebrates and are known to eat smaller individuals of their own species.

Life History of Western Toad

Breeding typically occurs from May to July in shallow areas of large and small lakes, ponds, slow moving streams, backwater channels of rivers, and roadside ditches (Black 1970a , Metter 1961; as cited by Maxell 2000).

Tadpoles metamorphose in mass in 40 to 70 days and can be found in dense aggregations of hundreds of individuals adjacent to breeding grounds upon emergence during summer (Maxell 2000). Young toads are limited in distribution and movement by available moist habitat but adults can move several miles to reach their habitats (Loeffler 1998). Adult and juvenile toads are freeze-intolerant. During winter they hibernate in subterranean chambers under-laid by flowing groundwater to prevent freezing (Campbell 1970) or in small mammal burrows below the frost line (Loeffler 1998, Maxell 2000).

Western Toad Status

The western toad, is currently recognized as two subspecies ranging from the Rocky Mountains to the Pacific Coast and from Baja Mexico to southeast Alaska and the Yukon Territory (Stebbins 1985 as cited by Maxell 2000). One subspecies, the boreal toad, is recognized in Montana.

Within the last 25 years, populations of boreal toads have undergone population crashes in Colorado, Utah, southeast Wyoming and New Mexico (Loeffler 1998). In the northern Rocky Mountains boreal toads have also undergone declines. Surveys in the late 1990s revealed they were absent from a number of areas they historically occupied. While they remain widespread across the landscape, they appear to be occupying only 5 to 10 percent or less of the suitable habitat (Maxell 2000).

Based on these findings the USFS listed the boreal toad as sensitive in all of Region 1's National Forests, and initiated a regional inventory in Montana. As a result, a systematic inventory of standing water bodies in 40 randomly chosen 6th level hydrologic unit code (HUC) watersheds was completed across western Montana during the summer of 2000. Results indicated they were widespread, but extremely rare.

Western Toad Status Forestwide

Boreal toads in the Big Hole drainage are well distributed, but rare. Similarly, boreal toads seem broadly distributed forestwide. Apparent "holes" of absence in places like the central portion of the Pioneer Mountains, are likely artifacts of limited surveys

Across 78 randomly selected watersheds, Maxell (2004b) determined frequency of occurrence of toads and their breeding habitats. Western toads likely occur in slightly more than 1/3 of the watersheds and 7% of suitable sites within watersheds. This is nearly identical to what Enriquez (2003) found in the Big Hole, where toads were found in 34% of the watersheds and 7.6% of the sites inventoried. Consistency between these data sets seems to support the results of both studies.

The survey and sample design used by Maxell (2004b) allow his data to be extrapolated across the study area. His results suggest we can be 95% certain toads are present in 178 to 329 HUCs in and around the Forest. We also expect they inhabit between 411 and 675 lentic sites (of an estimated total of 7766 locations with suitable habitat) across the study area.

Risks and Threats to Western Toad

The ratings of risk for western toad on the BDNF suggest the species has probably undergone significant decline. Maxell (2004b) stated western toad was widespread but rare in and around the BDNF. This species probably exhibits highly variable recruitment and survival, depressed population levels, which also may be declining (Table 2).

Table 2 Risk ratings and the reasoning behind them for western toad (WT)on the BDNF.

RISK	RISK RATING FOR WT ON BDNF	REASONS FOR RISK RATING
Highly Variable Recruitment or Survival	High	Although toads are fairly broadly distributed, they were detected in only 7% of the lentic sites surveyed in southwestern Montana; and breeding in only 4% This situation lends itself to reasonably high potential for strong fluctuations in recruitment and the potential for year-class failures
Declining Trend in Population	High?	While habitats are not as abundant as they once were, due to irrigation diversions and other actions, Maxell (2004b) found over 90% of the available habitat was not being used. This indicates that populations are probably depressed. Based on downward trends in other western states, it seems likely toad populations are probably declining
Depressed or Small Population Size	High	The incidence of habitat use indicates populations are depressed.
Population is Isolated	Moderate	While studies have shown that toads can and do move a fair distance, the low percentage of breeding habitats used suggests at least some populations are probably isolated

Revised Forest Plan Influence on Risks and Threats to Western Toad

The Aquatic Resources Management Strategy in the Preferred Alternative consists of 3 primary elements that should help western toad persist across the planning unit:

- 1) **Standard 2:** Evaluate the risks of aquatic nuisance /exotic species introduction as part of project analysis (Scale – Project area).
- 2) **Standard 5:** New activities within known sensitive amphibian breeding sites and natal areas during breeding and juvenile rearing periods will not cause a threat to viability or a trend toward federal listing (Scale - Breeding sites and natal areas identified at the project level). Effects from ongoing activities, including livestock grazing and recreation and travel management are addressed in Table 3 below.
- *3)* **Standard 24:** Chemical pesticides and toxicants will be applied in a manner consistent with desired stream function and avoids adverse biological effects.
- 4) **Other mitigations** designed for aquatic species protection when doing herbicide treatments were established in the Beaverhead-Deerlodge National Forest Noxious Weed Control FEIS and Record of Decision (2002). These continue to be requirements. Some of mitigations in the FEIS are as follows:

  A) Herbicides will not be applied to open water. Mitigation will apply on sites where leaching to ground water is possible. See decision table on page 2-4. Manual, Biological or Cultural methods will be employed where herbicide use is inappropriate.

  B) Aerial application will maintain a 300-foot buffer from open water in response to concerns about amphibians …. Field inspectors will provide on-site monitoring for drift and label compliance.

  C) All herbicide storage, mixing, and post-application equipment cleaning is completed in such a manner as to prevent the potential contamination of any Riparian Habitat Conservation Area, perennial or intermittent waterway, unprotected ephemeral waterway, or wetland.

  D) Herbicide applicators shall carry spill containment equipment, be familiar with and carry an Herbicide Emergency Spill Plan.

  E) When ground application of appropriate herbicide is immediately adjacent to a water body, surveys of the treatment area will be required. If leopard frogs; mature adult western toads or concentrations of recently metamorphosed immature adult western toads are identified, the extent of distribution within the proposed treatment area will be marked on the ground and reported to the district fisheries biologist and weed coordinator and within 2 days. If treatment is not possible without directly spraying individuals then hand pulling or wick application could be applied. Otherwise, ground application of herbicides within the marked area will be delayed until individuals disperse,

- 5) Implementation of a riparian conservation strategy (INFISH modified) for all streams forestwide. Modifications to INFISH were done to help clarify its intent, facilitate consistency in its application, reduce conflicts with recent policy and regulation decisions, and customize resource management objectives to improve its applicability to stream systems east of the continental divide

These 5 elements are supplemented with additional direction fundamental to other aquatic objectives, which will also contribute to conservation of western toad on the Forest. These include designation of 57 fish key watersheds forestwide; and designation of 15 restoration key watersheds, to emphasize aquatic restoration at the watershed scale.

Table 3 displays management direction present in preferred Alternative 6 and its effectiveness in mitigating land management actions on the BDNF. Mortality to individuals is possible with vegetation and timber management, appropriate management response (wildfire), recreation and travel management, fire management, livestock grazing, oil and gas, and from non-native aquatic species. Each planned management activity could cause limited loss. Wildfire effects are more difficult to predict, however it is presumed in most instances, toads have natural tendencies and abilities to limit direct effects from wildfire.

Table 3 Provides an evaluation of preferred Alternative 6's effectiveness in mitigating BDNF's land management actions (threats) on western toad; and the estimated level of impact to the species.

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
Vegetation and Timber Management	Sedimentation; Loss of stream-side vegetation; loss of woody debris on the ground that makes hiding cover and shade; potential mortality to individuals from equipment and/or vehicles	**Riparian Management Objectives** The RMOs in the Revised Plan apply by stream reach until new RMOs are developed through watershed or other site specific analysis, **Standard #1** Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA **Standard #5:** New activities within known sensitive amphibian breeding sites and natal areas during breeding and juvenile rearing periods will not cause a threat to viability or a trend toward federal listing;. **Standard # 25**: Project related storage of fuels and toxicants within Riparian Conservation Areas is prohibited. **Standard #26**; Fuel-wood cutting and salvage in RCAs will not prevent or retard attainment of desired stream function **Standard #27**; Vegetation and/or fuel management prescriptions in RCAs will be for the purpose of restoring, enhancing, or protecting	No measurable sedimentation or loss of stream side vegetation if it is determined to be detrimental. Possible mortality to individuals. Incidences should be rare and mortality rates should not be substantial because actions will be occurring outside riparian areas in most cases and will not be in a location where individuals are concentrated. If activity is in riparian the risks for high levels mortality will be mitigated by adjusting the timing of the management action.

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		the physical and biological characteristics of the RCA	
Wildlife Habitat Management	Maybe some benefit through reductions in roads	**None**	Benefit; but probably not measurable
Appropriate Management Response (Fire)	In any wildfire there is a risk of mortality to individuals	**None**, but opportunity to provide input into development of Fire Management Plan	Possible loss of individuals. Presume amphibians have natural escape mechanisms that typically prevent catastrophic level mortalities from most natural disturbances.
Recreation and Travel Management	Introduction of ANS; degradation of habitat through sedimentation; Mortality to individuals from impacts to motorized vehicles (road kill)	**Objective: RMOs** guide management actions to achieve quantitative objectives; **Objective: Road drainage**; Reconstruct road and drainage features that …. are proven less effective than designed for controlling sediment delivery, or retard attainment of desired stream function, or increase sedimentation in Fish or Restoration Key Watersheds **Objective Roads**; Close and stabilize or obliterate and stabilize roads not needed for future management activities **Objective Recreation sites**: Recreation sites are adjusted if not meeting desired conditions; **Standard #1** New activities in RCAs maintain or improve the physical and biological characteristics; **Standard #2;** Evaluate risks of ANS introduction as part of project analysis; **Standard #18:** Where no alternative to placing facilities exists outside RCA avoid impacts to RCA and Negative effects on fish. **Standard #19;** Solid and sanitary waste facilities in RCAs are prohibited; **Standard #23:** Terminate recreation activities that cannot be adjusted to be consistent with achieving desired stream	Reduced risk of ANS introduction, but no way to completely remove risk. Mortality to individuals will occur from impacts with vehicles. It has been documented on the Forest but only at very low incidences, except at one location near a breeding site. An amphibian crossing is expected to be installed there in FY2009. Other site specific issues will be dealt with as we become aware of them.. Sedimentation will continue to occur with some impact to habitat, but probably not to a substantial effect on the species.

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		function. **Standard #28;** Complete evaluations of ongoing activities in Fish key watersheds. Those inconsistent with goals and objectives will be identified within 3 years and timeframes for implementation of mitigation will be identified.	
Fire Management	Prescribed burns in areas being colonized by conifers could result in mortality to individuals; sedimentation and an increase in water temperature.	**Standard #11** Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA	Mortality may occur to individuals outside of RCA, but at levels that are unlikely to substantially influence population viability, because they disperse as they migrate away from breeding sites
Livestock Grazing	alteration and degradation of habitat Potential to kill large numbers of juveniles through trampling;	**Standard #1** Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA; **Standard 14:** Grazing practices that prevent attainment of desired stream function, or are likely to adversely affect threatened or endangered species, or adversely impact sensitive species, are modified to attain desired stream function or population objectives; **Standard 15:** Locate new livestock handling and/or management facilities outside of Riparian Conservation Areas. **Standard 16:** Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that would not retard or prevent attainment of desired stream function or adversely affect native fish and sensitive aquatic species	Maxell (2004) identified lentic sites (lakes, ponds and wetlands) that appear to have been sufficiently altered by livestock grazing to negatively impact amphibians. The frequency that this is occurring within the analysis area, under existing grazing management, appears to average about 3% of the available sites; Observations suggest toads often seek areas of disturbance, indicating some level of grazing disturbance is probably preferred, so long as it isn't excessive enough to alter water tables or important vegetative characteristics. A "managed level of disturbance" achieved through livestock grazing may be desirable Mortality to toads may occur, but should not happen on a substantial scale. When concentrations of individuals are identified to be at risk, effects will be mitigated in accordance with standards 14 and 16.

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
Oil and Gas Leasing	Potential sedimentation; potential mortality to individuals from vehicles	CSU stipulations across most of the Forest; NSO stipulations in fish key watersheds.	Limited amount of sedimentation, probably un-measurable; Some mortality to individuals, but this should largely be incidental.
Non-Native Influence	Exclusion from certain habitats; predation on larvae	**None** **Other Considerations:** There are fish removal projects occurring forestwide at a limited scale	Impacts to toads from non-native fish will continue at a rate that is occurring today
Aquatic Resource Management	Improvement in habitat through watershed improvement projects	**None -** Beneficial	Habitat conditions will improve for some populations, due to the Aquatic focus on restoration.

Table 4. An assessment of the effects of BDNF land management actions on western toad, after implementing mitigations in preferred Alternative 6. Listed are the scope and duration of effects and whether they are likely to contribute to species risks or to population level extinction.

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	DETERMINATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
Vegetation and Timber Management	Scope be across several populations but limited in its effects These management actions could have minor influences on upland habitat or to a limited number of individuals in different populations forestwide	Sedimentation or loss of habitat is negligible. Mortality to individuals will be limited, but could occur throughout the planning period, thus will probably be for 2 to 3 generations	The risks to western toad are high for all 4 of the risks evaluated in this analysis. Loss of individuals could be significant if it occurs to a large number of members of a single population. The management direction in Alternative 6, protects against this by strongly limiting management in riparian areas, where toads concentrate. When they disperse, there is low likelihood that management projects would cause mortality to a substantial number of individuals. For this reason there should be: No substantial contribution to risks or to population level extinctions
Wildlife Habitat Management	May have a positive effect on boreal toads through closing roads. Scope of effect is limited; 0-5 populations. Since the number of closures are relatively few and populations are so dispersed there is a relatively low likelihood that a large number of populations will be affected.	Long term 10 – 40 years	Effects are beneficial No substantial contribution to risks or to population level extinctions
Appropriate Management Response (Fire)	Scope is limited, possibly mortalities to individuals from 5-10 populations because populations are not abundant and are scattered forestwide. Mortality to individuals should be limited, but wild fire could have substantial impacts on a population if individuals are congregated in a riparian area. It is likely the stream or	In most instances 1 generation. If a large part of a population is lost, the effects could ripple through 2-3 generations.	It is most likely that a few individuals from populations will be lost because there are probably opportunities for escape into water-bodies or burrows. There is some potential for a large portion of a population to be lost if they were congregated around a breeding site. This seems as though it would be a very rare occurrence. In general, appropriate management response should not increase risk or the potential for population level extinction

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	DETERMINATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
	pond could provide escape from the fire in many instances.,		
Recreation and Travel Management	Scope of effect is limited, occasional individuals from a population.	In most instances 1 generation	Traffic rates on most roads in the BDNF are very light relative to areas where substantial mortalities can occur from road-kill. We estimate the average rate of traffic on roads forestwide is less than 10 vehicles per day. On one of our most heavily used Level 3 roads on the Forest the average use during July was about 7 cars per hour. Many of the studies that talk about significant levels of road kill are from heavily populated areas and on paved roads. Does not contribute substantially to risk and to population level extinction
Fire Management	Very limited scope; effects should be discountable	NA	Does not contribute substantially to risk and to population level extinction
Livestock Grazing	Degradation of habitat; Scope is limited 3% of available habitats. Mortality of individuals	Habitat effects 5-15 years Mortality effects 1 -2 generations	Habitat effects are limited enough as to not substantially increase risk. Mortality to individuals is addressed through standard 14 and 16 and can be addressed rather easily, by using temporary or permanent fence. Livestock grazing should not contribute substantially to risk or to population level extinctions.
Oil and Gas Leasing	Scope is very limited, probably unlikely to occur where grayling persist	Mortality to individuals 1 generation	Effects on habitat are insignificant. Mortality to individuals will be largely incidental. Does not contribute to risk and to population level extinction
Non-Native Influence	Scope is limited to the Ruby River drainage. Some competition for space may be occurring, but hasn't been documented.	Could be rather long term > 40 years	Impacts will continue at current rate. It is unknown whether it contributes to risk. We do not manage non-native species.
Aquatic Resource Management	There are fair opportunities for watershed improvements and available funds associated with the TMDL program. The	Long term > 40 years	Effect is beneficial.

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	DETERMINATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
	scope of effect is probably moderate		

Effects on sensitive amphibians from herbicide application are addressed in the Biological Evaluation in Appendix M of the Beaverhead-Deerlodge National Forest Noxious Weed Control FEIS and Record of Decision *(2002)*.

Western Toad Viability Conclusions

Table 4 provides determinations regarding effects of Forest management actions on western toad, under the direction of preferred Alternative 6. No actions appeared likely to substantially contribute to risks or to population level extinctions, even though most had some probability of causing mortality to individuals.

This may seem odd in the face of the high risk ratings given toads (Table 2). However, the favorable determinations for toads were primarily based on 4 premises: First, there is substantial guidance in the Revised Plan that limits management actions in riparian areas; the areas where toads tend to congregate and actions could affect toads in larger numbers. Second, while it seems plausible mortality to individuals will occur, it will likely happen sporadically and at very low levels. Since toad are sparsely distributed across the Forest, there is a low likelihood management projects would occur in the same space and time that toads are present. Third, if occasional mortalities occur, it is likely that a very few individuals would be lost, since they would be in uplands where the toads tend not to be congregated in high densities; and fourth , spatial and temporal distribution of most new management actions that can cause direct mortality (like equipment related mortality from timber sales), coupled with toads ability to move away from areas with a lot of activity, lead me to believe there is low likelihood substantial mortality would occur within single populations.

Based on the determinations provided in Table 4, my determination for western toad relative to management direction in Alternative 6 of the Revised Forest Plan is:

May impact individuals, but will not likely contribute to a trend towards federal listing or reduced viability for the species;

Fluvial Arctic Grayling

Due to this decline, the Service was petitioned in 1991 to list the fluvial Arctic grayling under the Endangered Species Act. In 1994 the Service determined that listing the grayling of the upper Missouri River was "warranted but precluded." From 1994 to 2004 the fluvial Arctic grayling of the upper Missouri River remained a candidate species with a listing priority of 9, indicating threats were moderate-to-low in magnitude and imminent. In May 2004, the listing priority was upgraded to 3, indicating threats were of high magnitude and imminent. During 2003 to 2005, the Service was involved in litigation with the Center for Biological Diversity and the Western Watershed Project over the continuing "warranted but

precluded" determination. The Service settled a lawsuit over the legal status of the grayling on August 9, 2005, and agreed to make a final listing determination by April 16, 2007.

Montana Fish, Wildlife and Parks received an enhancement of survival permit under the Service's Candidate Conservation Agreement with Assurances (CCAA) program to conserve and enhance the grayling in the upper Big Hole River. The Natural Resources Conservation Service and Montana Department of Natural Resources are also signatories to the CCAA

Habitat Requirements Grayling

Fluvial grayling in the Big Hole River tend to be found where the gradient approaches 3%. They spend most of their time in pools and have been found to have greatest densities where pools are the most abundant. Pools appear to be especially important as over-winter habitat. Areas with low current velocity appear to be important for young fry (Kaya 1990).

Life History of Grayling

Spawning in the Big Hole River occurs in late April. Although there has only been limited reproduction in the Ruby, biologists estimate it is probably occurring around the middle of April. Ruby river fry have probably emerged by 1st of June (Magee 2007, Personal Communication).

Arctic grayling rarely live beyond five years in the Big Hole River. Fast growth rates and short life spans result in combination of spawning by fish aged 3 and 4 years. Thus, poor recruitment in a given year may substantially affect recruitment to the population for several years (AFS 2007).

Grayling Status and Distribution

Arctic grayling are native to drainages of the Arctic Ocean, Hudson Bay and northern Pacific Ocean in North America and Asia. Two distinct populations historically inhabited waters in Michigan and Montana. The Michigan population is now extinct. The *fluvial* (river-dwelling) arctic grayling population which was widespread in the Missouri River basin above Great Falls, Montana has declined significantly in range and abundance. The remaining confirmed, viable population resides in the Big Hole River, upstream from Divide, representing 4% of grayling’s native, historic range

Grayling Status and Distribution Forestwide

Because grayling require long reaches of uninterrupted stream course and are usually found in streams larger than head-water tributaries common to the BDNF, suitable habitat primarily occurs downstream of the Forest Boundary. Where this is so, the benefit of BDNF management occurs when cold, clean water from our streams supplements flows in the larger streams below.

Grayling currently occupy about 550 streams miles within the BDNF analysis area. Most of these miles (430) are off forest in the Big Hole River drainage and are focused in the Big Hole River. Although fluvial Arctic grayling inhabit the entire Big Hole, highest densities

occur in the Wisdom vicinity. The majority of spawning occurs near Wisdom in the mainstem and several tributaries. Fluvial Arctic grayling are reared in the vicinity where they hatched, thus, the Wisdom area provides the majority of rearing habitat as well.

About 55 of the 80 stream miles where grayling are present on NF lands consist of short segments of streams extending a short distance above the Forest boundary and are typically occupied intermittently. About twenty five of the stream miles are in the Upper Ruby River drainage, where Montana Fish, Wildlife and Parks has been trying to reestablish a self-sustaining wild population through re-introductions. The Ruby River, then, probably constitutes the most significant habitat on BDNF lands relative to grayling conservation and restoration.

VIABILITY ANALYSIS for GRAYLING

Risks and Threats

The risk ratings for grayling on the BDNF are consistent with a species that remains in only a small portion of its range in Montana. This species exhibits highly variable recruitment and survival, depressed population levels, which have been declining (Table 5). The Big Hole and Ruby Populations are isolated from each other, but have substantial lengths of river, they can move within. This is in contrast to isolated WCT populations, which often tend to be restricted in stream of only a couple of miles.

Table 5. Risk ratings and the reasoning behind them for grayling in the analysis area.

RISK	RISK RATING FOR GRAYLING ON BDNF	REASONS FOR RISK RATING
Highly Variable Recruitment or Survival	High	MFWP data on the Big Hole indicates recruitment and survival are strongly influenced by reduced summer flows, which have been common over the last 15 years
Declining Trend in Population	High	Documented by MFWP
Depressed or Small Population Size	High	Documented by MFWP
Population is Isolated	High	Restricted to Upper Big Hole and Upper Ruby Drainages

Revised Forest Plan Influences on Risks and Threats to Grayling

The Aquatic Resources Management Strategy in the Preferred Alternative, consists of 2 primary elements that should help maintain grayling viability across the planning unit:

- Implementation of a riparian conservation strategy (INFISH modified) for all streams forestwide. Modifications to INFISH were done to help clarify its intent, facilitate

consistency in its application, reduce conflicts with recent policy and regulation decisions, and customize resource management objectives to improve its applicability to stream systems east of the continental divide

- A requirement designed to reduce the risk of aquatic nuisance species (ANS) introductions from new management actions.

These elements are supplemented with additional direction fundamental to other aquatic objectives, which will also contribute to conservation of sensitive species on the Forest.

Table 6 displays management direction present in preferred Alternative 6 and its effectiveness in mitigating land management actions on the BDNF with regard to grayling. The most likely occurrences for management impacts on grayling would be in the Ruby River drainage. In most of the other stream miles where grayling occur on the Forest, they are only intermittently or seasonally present. For that reason this analysis primarily focuses on likely effects of management on the Ruby's reintroduced population.

Recreation and travel management, and livestock grazing are the management actions with the greatest potential to impact grayling. Based on mitigations in preferred alternative 6, both actions are likely to cause or maintain some level of habitat degradation; however they probably won't be limiting grayling. This is primarily because the primary limitations in the Ruby drainage are related to natural geologic instability in the watershed. The bed-load derived from common hill-slope failures exceeds the capacity of the system to transport it. This promotes substantial channel instability and instream habitats that are limited in quality. The 2 most fundamental limitations for grayling are the availability of pools and the availability of spawning habitat (Jim Magee MFWP, personal communication) Thus, natural processes in the system are essentially de-emphasizing the significance of some of our land management effects.

Grayling Viability Conclusions

Table 7 below provides determinations regarding effects of Forest management actions on grayling, under the direction of preferred Alternative 6. The determinations were based on the estimated scope and effect of management actions on grayling.

No actions appeared likely to contribute to risks or to population level extinctions. Even though recreation and travel and grazing had the potential to have an influence on risk, the magnitude of influence natural processes are having on habitat conditions in the Ruby drainage, the significance of management influence estimated to occur on grayling, even from a cumulative standpoint, is likely discountable.

Based on the determinations provided in Table 7, my determination for western toad relative to management direction in Alternative 6 of the Revised Forest Plan is:

May impact individuals, but will not likely contribute to a trend towards federal listing or reduced viability for the species.

Table 6 Provides an evaluation of preferred Alternative 6's effectiveness in mitigating BDNF's land management actions (threats) on grayling; and the estimated level of impact to the species

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
Vegetation and Timber Management	Decrease in habitat complexity through sedimentation and loss of large woody debris; decrease in habitat quality through change in water temperatures; sedimentation and loss of large woody debris and potential change in hydrograph; possibility of fuel spills	**Riparian Management Objectives** The RMOs in the Revised Plan apply by stream reach until new RMOs are developed through watershed or other site specific analysis, **Standard #1** Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA; **Standard # 25**: Project related storage of fuels and toxicants within Riparian Conservation Areas is prohibited. **Standard #26**; Fuel-wood cutting and salvage in RCAs will not prevent or retard attainment of desired stream function **Standard #27**; Vegetation and/or fuel management prescriptions in RCAs will be for the purpose of restoring, enhancing, or protecting the physical and biological characteristics of the RCA	No reduction in large woody debris or increases in temperature, due to RCA management direction, RMOs and stream-side buffers; no measurable sedimentation due to RCA management direction, RMOs and stream-side buffers; no negative changes in hydrograph; No contamination from fuel spills No measurable effects
Wildlife Habitat Management	Positive influence on Habitat Quality; by reducing sedimentation; reduction in roads and trails	**Objective Roads**; Close and stabilize or obliterate and stabilize roads not needed for future management activities**.** beneficial if it occurs near WCT occupied stream	Would not occur within presently occupied Grayling Habitat; No Effect
Appropriate Management Response (Fire)	Decrease in habitat complexity Decrease habitat quality Sedimentation and changes in the temperature regime from fire and suppression activities. direct mortality from retardant Direct mortality	**Objective appropriate management response**. Suppression activities are designed and implemented so as not to prevent attainment of desired stream function, and to minimize disturbance of riparian ground cover and vegetation. **Objective: Temporary Fire Facilities :** Incident bases, camps, helibases, staging areas, heli-spots and other centers for incident activities are located outside of RCAs; **Objective Fire Suppression:** Chemical retardant, foam, or additives are not delivered to surface waters. **Standard 10:** If the only suitable location for incident	Fire is unlikely to occur near grayling inhabited waters on the Forest because their distribution is so limited and they no longer persist in forested systems. Impacts to habitat from sedimentation and temperature elevation could happen if fire burns in a drainage occupied by grayling. . Impacts should be relatively small and short in duration; Mortality to individuals from retardant drops, seem highly unlikely

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
	from wildfire;. Possible ANS introductions	bases, camps, helibases, staging areas, helispots and other centers for incident activities are within the RCA, an exemption may be granted following a review and recommendation by a resource advisor. **Standard #11** Monitor water quality and aquatic resources in fish key watersheds where chemical retardant, foam, or additives are delivered to surface waters. Monitoring should take place as soon as conditions allow for safe access. Other considerations: **The Beaverhead-Deerlodge NF Aviation in Briefing Booklet** contains the BDNF Aquatic Nuisance Species Prevention Strategy (ANSPS); Appropriate management response will often be guided by direction in a Fire Management Plan for that area. Issues specific to TES species will likely be considered in developing the plans.	Introduction of ANS can still occur, but direction to minimize risk is accepted and the procedures directed in the ANSPS are being implemented. In summary, habitat impacts could occur , but they should be minor and short in duration
Recreation and Travel Management	.Potential Introduction of Aquatic Nuisance Species; Sedimentation to streams. Sanitary wastes into streams	**Objective: RMOs** guide management actions to achieve quantitative objectives; **Objective: Road drainage**; Reconstruct road and drainage features that …. are proven less effective than designed for controlling sediment delivery, or retard attainment of desired stream function, or increase sedimentation in Fish or Restoration Key Watersheds **Objective Roads**; Close and stabilize or obliterate and stabilize roads not needed for future management activities **Objective Recreation sites**: Recreation sites are adjusted if not meeting desired conditions; **Standard #1** New activities in RCAs maintain or improve the physical and biological characteristics; **Standard #2;** Evaluate risks of ANS introduction as part of project analysis; **Standard #18:** Where no alternative to placing facilities exists outside RCA avoid impacts to RCA and Negative effects on fish.	Reduced risk of ANS introduction, but not eliminated. Sedimentation impacts from roads will continue to result in impacts Recreation sites will be substantially mitigated probably within the life of the plan With regard to some of the hurdles grayling face in becoming established in the Ruby system. The primary limitations are related to natural functioning processes in the watershed. The 2 most fundamental limitations are the availability of pools and the availability of spawning habitat (Jim Magee MFWP, personal communication) Because the system is naturally so dynamic because

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		Standard #19; Solid and sanitary waste facilities in RCAs are prohibited; **Standard #23:** Terminate recreation activities that cannot be adjusted to be consistent with achieving desired stream function. **Standard #28;** Complete evaluations of ongoing activities in Fish key watersheds. Those inconsistent with goals and objectives will be identified within 3 years and timeframes for implementation of mitigation will be identified.	of the high geologic instability there, sediment introduction does not have the same significance it would in other systems. Some impacts from degraded habitat but not a significant influence
Fire Management	Prescribed fire is done under a prescription which minimizes risk of escape and allows the placement of treatment to be fairly precise. There is some potential for escape but it is uncommon. Effects could be sedimentation and an increase in water temperature.	**Standard #1** Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA	Effects from Prescribed fire should be discountable
Livestock Grazing	Decrease in habitat quality; Grazing will maintain or increase amount of degraded habitat in some WCT streams; mortality of eggs and fry will occur in some streams.	**Objective: Spawning areas;** Reduce impacts from grazing practices in known or suspected threatened, endangered or sensitive fish spawning areas:.; **Standard 14**; Grazing practices that prevent attainment of desired stream function, or are likely to adversely affect threatened or endangered species, or adversely impact sensitive species, are modified; **Standard #15; :** Locate new livestock handling and/or management facilities outside of Riparian Conservation Areas; **Standard #16** Limit livestock trailing, bedding, watering, salting,	There is no over-lap in time between grazing and the period of egg development to emergence on the National Forest. Thus there are no effects Effective implementation of grazing practices will occur at a rate that is consistent with what has occurred over the last 10 years. Effects on grayling are limited

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATIONS IN ALTERNATIVE 6	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		loading, and other handling efforts to those areas and times that would not retard or prevent attainment of desired stream function;	
Oil and Gas Leasing	Decrease in habitat quality primarily through sedimentation	CSU stipulations apply	Minor to no effect on grayling
Non-Native Influence	Decrease in habitat occupied; Decrease in available habitat; Decrease in distribution; loss of connected habitats; Mortality, loss of individuals;	**None** – The USFS does not manage populations, this is the State of Montana's responsibility **Other Considerations**: Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat trout and Yellowstone Cutthroat Trout in Montana 2007; under objective 1: Securing and enhancing populations will most frequently involve either limiting or removing nonnative species, conserving or restoring habitat. MFWP is conducting Non-native removals a limited level, due to limitations in funding and man-power. They are initiated and directed by Montana Fish, wildlife and parks. BDNF will assist in setting priorities and doing removal projects	Some competition may be occurring in the Ruby River where MFWP is trying to re-establish grayling BDNF doesn't manage non-natives that is responsibility of State of Montana
Aquatic Resource Management	Increase habitat quality; Increase Watershed Condition	**None** - beneficial	Habitat conditions should improve

Table 7. An assessment of the effects of BDNF land management actions on grayling, after implementing mitigations in preferred Alternative 6. Listed are the scope and duration of effects and whether they are likely to contribute to species risks or to population level extinction.

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	DETERMINATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
Vegetation and Timber Management	Very limited scope; Insignificant based on Mitigations in plan	Not applicable	There should be no contribution to risks or to population level extinction
Wildlife Habitat Management	Will not influence grayling	NA	There is No Effect
Appropriate Management Response (Fire)	Scope is extremely limited (0-3 streams) because there are only a few streams on Forest that can be affected	Likely that severity would be limited	Habitat effects would probably be small and short in duration. Some risk of ANS introduction, but again small because of the limited distribution of the species There should be no substantial contribution to risks or to population level extinction.
Recreation and Travel Management	Scope of effect is limited,	Minor impacts which do not substantially influence the species, so short term.	Some risk of ANS introduction, but probably would most likely occur in the Ruby where anglers have a reasonable chance of being the source of introduction. This risk will not change based on management direction in Alternative 6. There should be no contribution to risks or to population level extinction
Fire Management	Very limited scope; effects should be discountable	NA	Fire Management will not contribute to risks or to population level extinction.
Livestock Grazing	Scope is limited but and possibly most important in the Upper Ruby river drainage. Some areas of habitat disturbance, in tributaries, but effects in mainstem where grayling occur are somewhat overwhelmed by the natural instability of the	Limited effects with duration of 5-15 years.	Livestock trampling is not a factor with grayling eggs and larvae. Because there is no over-lap between the time of egg and larval development and when livestock are grazing. Effects from impacted habitat on grayling are limited. Will not contribute to Risks or to population level extinction.

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	DETERMINATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
	system.		
Oil and Gas Leasing	Scope is very limited, probably unlikely to occur where grayling persist	Limited effects with short duration	Will not contribute to Risks or to population level extinction.
Non-Native Influence	Scope is limited to the Ruby River drainage. Some competition for space may occur, but has not been documented.	If it is occurring, the duration will be long-term 40 – 100 years	**May contribute to risks or to population level extinction** but habitat is probably the more limiting factor.
Aquatic Resource Management	There are fair opportunities for watershed improvements and available funds associated with the TMDL program. The scope of effect is probably moderate	Improvements should be very long term 40-100 years.	Does not contribute to risks or to population level extinction. Effects will be beneficial to grayling populations.

WESTSLOPE CUTTHROAT TROUT

Habitat Requirements of Westslope Cutthroat Trout

Optimal stream habitat for westslope cutthroat trout has been described as being clear, cold streams with un-embedded substrate, with relatively abundant slow deep pools, well vegetated and stable stream banks and abundant in-stream cover (Hickman & Raleigh 1982). On the BDNF, most populations occur in 1st through 3rd order streams. This is consistent with what Ireland (1993) found on the Gallatin National Forest in upper Cache and Wapiti Creek drainages. She found densities declined as stream size increased. Rieman and Apperson (1989) also describe WCT occurrence as being focused in higher elevation headwater streams, but acknowledge some populations use entire drainages.

Seasonal movements are probably tied to the availability of spawning, rearing and over-winter habitats (Rieman & Apperson 1989). Spawning habitat was described by Shepard et al. (1984) as gravels ranging from 2 to 75 mm in diameter, with water depths from 17 to 20 cm and velocities between 0.3 and 0.4 m/sec. Cover and complex habitats are important.

Woody debris associated with lateral stream margins and within pools increases habitat complexity and the potential to support higher trout densities.

Gravel substrates are important cover for juveniles. Jakober (1995) found that small WCT hid in the substrate interstices of larger substrate during the day, while larger fish congregated in deep low velocity pools.

The habitats preferred by WCT are not limiting on the BDNF. The Forest sits in the headwaters of the Missouri and Clark Fork River drainages. Clear, cold streams with high quality pools and spawning, rearing and over-winter habitats are abundant and well distributed forestwide. Non-the-less, there are stream segments that fail to meet desired conditions. Of 675 stream reaches surveyed, in the last 16 years, to assess stream function, 166 (25%) were non-functioning and 129 (19%) were functioning at risk. Recent monitoring indicates these numbers have not substantially changed.

This data should not be interpreted to mean 25% of stream miles on the BDNF are non-functioning. Survey location selection was not random, so the data cannot be extrapolated forestwide. Selection of sites was guided by the need to help describe conditions and address grazing issues in heavily used pastures and allotments. For this reason, the results are appropriately skewed and highlight areas where management needs to be more purposeful in meeting aquatic resource goals and objectives.

In considering the importance of this data regarding WCT viability requirements under NFMA, a couple of points should be made:

- It is assumed if a stream is functioning properly, the quantity and quality of the habitat it provides is adequate to provide healthy robust aquatic populations. This is assumed because the method used to asses proper function evaluates channel morphologies against those that form naturally in response to local hydrographs, valley widths, gradients and geologies. Hydrologic processes in functioning streams are working efficiently enough that sediment and bedload transport are not inducing excessive channel instability. Thus, in-stream habitat features are relatively stable in abundance and quality and reflect the capability of natural processes, in that setting.

- “Functioning at Risk” is a term used to describe stream reaches where conditions are somewhat degraded, but hydro-geomorphic processes are still working adequately. There is some risk function might be lost. Because the processes are still adequate the system has drifted away from its potential. As such, it provides habitat in abundance and quality that is reduced, but still adequate to support populations, because the hydro-geomorphic processes are still intact, but not impaired enough to cause substantial instability in the channel.

- If a stream is non-functioning, there is substantial instability because hydrologic processes are out of balance with the geomorphic setting. This usually results in substantial reductions in habitat quality and quantity and in the capacity of the stream to support a healthy population. Thus, densities are usually substantially reduced from what the stream is capable of supporting if it is functioning properly. The fact that a stream segment is non-functioning, however, cannot be translated to

While some stream reaches on the Forest are not at desired conditions, the availability of suitable WCT habitat is abundant and broadly distributed such that it is capable of sustaining healthy, well connected populations of WCT across the BDNF.

Life History of Westslope Cutthroat Trout

Westslope cutthroat trout commonly express 3 different life history patterns, which differ based on migration patterns and rearing tendencies. 1) Resident fish spend their entire life within a tributary stream; 2) Fluvial fish rear for a period of years in tributary streams, then migrate downstream to a river to grow and mature; then return to their natal stream to spawn; 3) Adfluvial fish spawn and rear in tributary streams, but move into lakes to mature.

Data collected on the BDNF have not differentiated between fluvial and adfluvial WCT life histories. Populations are simply considered migratory or resident. While adfluvial populations may be present, the preponderance of migratory cutthroat is undoubtedly fluvial. This likely reflects the fact that few mid to low elevation lakes are present within the analysis area; and they lack suitable migratory corridors linking spawning and rearing habitats.

Resident life histories are present in 1,223 miles of stream occupied by conservation populations. Migratory life histories are present in 413 miles. Only 10% of the stream miles supporting migratory populations occur east of the continental divide (Chapter 3, FEIS).

Westslope Cutthroat Trout Status

WCT historically occupied about 56,500 miles of stream in the United States and now occupy about 33,500 (59 percent) of those stream miles. About 33,000 of the historically occupied stream miles were in Montana, 19,000 in Idaho, 1,000 in Oregon, 3,000 in Washington, and 100 miles in Wyoming (Shepard et al. 2005).

Currently, 563 populations are considered to have conservation value and occupy 24,450 miles of stream (43% of the historically occupied habitat). Eighty-one percent (457) of the conservation populations (hereafter referred to simply as populations) are believed to be isolated and so have lost the benefit of exchanging individuals with other populations. These “isolates” however, only occupy 12 percent of the habitat. Meta-populations exist in about 21,600 miles of stream (88% of currently occupied), but only represent 19 percent of the total number of populations. Populations are spread throughout the historical range, occurring in 67 of the 70 HUCs historically occupied by WCT.

Tested and genetically pure occupy 3,470 miles (6.2% of historic distribution). Populations that occupy 9,108 miles (16% of historical habitats) are suspected of being genetically unaltered, based on the absence of introduced hybridizing species. Shepard et al. (2003) contend a minimum of 8% of historically occupied habitats are genetically unaltered.

Westslope Cutthroat Trout Status Forestwide

Based on data collected by Shepard et al. (2003), about 9,300 miles (28%) of WCT historic distribution in Montana, occurred in the BDNF analysis area. WCT were broadly distributed across the Beaverhead, Big Hole, Redrock, Madison, Ruby, Boulder, Jefferson, and Upper Clark Fork Rivers and Rock Creek drainages. Their best information suggests only 10 of 433 sub-watersheds (6th field HUCs) did not historically host westslope cutthroat trout.

Currently an estimated 173 populations are found in 172 6th field HUCS and about 1280 miles of stream within the analysis area, on and off forest (Table 8). They are broadly distributed across all 4th field HUCs (river drainages) containing BDNF lands, but their occurrence is much patchier east of the Continental Divide. In the five east-side river drainages, WCT occupy between 3 and 12% of their historic range. In two west-side drainages, they persist in 24 and 53 percent of the historic stream miles (Table 8).

Table 8. Status and distribution of westslope cutthroat trout conservation populations summarized across the analysis area, by river drainage. Data is presented as: the total number (#) of sub-watersheds (6th HUCs); the number of sub-watersheds with conservation populations (WCT Con-Pops); the miles of stream currently supporting conservation populations, and the proportion of stream miles that historically supported WCT populations that currently have conservation populations.

River Drainage	Total # 6th HUCs	# 6th HUCs With WCT Con-Pops	# WCT Con-Pops	# WCT Non-Con-Pops	Miles of Stream With Con-Pops	Proportion of Stream Miles Historically supporting WCT
Beaverhead	39	13	18	7	89	11 %
Big Hole	94	35	48	27	180	8 %
Boulder	24	8	6	1	30	6 %
Jefferson	31	4	7	2	21	3 %
Madison	51	7	9	20	32	4 %
Red Rock	82	32	40	22	179	11 %
Ruby	29	13	16	19	105	12 %
Flint-Rock	49	40	8	5	402	53 %
Upper Clark Fork	34	19	21	25	243	24 %
Total	433	172	173	128	1281	Ave =14 %

Total stream miles occupied by conservation populations are nearly balanced east versus west of the continental divide, however fewer populations are found on the west side. Twenty-nine populations occupy 646 stream miles west of the divide, while 144 populations east of the divide persist in 636 miles (Table 9). These data point to notable differences between populations separated by this geographic boundary. Conservation Populations persist in 36% of the historically occupied stream miles west of the divide. They persist in

only 8% of the historic habitats east of the divide. The average length of stream occupied by populations on the west side is 22.3 miles, while it is only 4.4 miles for those on the east side.

Table 9. Comparisons of range-wide miles of stream historically and currently occupied by WCT along with core and hybridized populations with those inside the BDNF analysis area, east and west of the Continental Divide.

Criteria	Range-Wide in United States	Beaverhead-Deerlodge Analysis Area		
		East of Continental Divide	West of Continental Divide	Total
Miles Historically Occupied	56,420	7520	1772	9292
Miles Currently Occupied *	24,454	636	645	1281
Proportion of Historic Range Currently Occupied *	43 %	8 %	36%	14%
Number of Populations *	563	144	29	173
Number of Core Populations **	172	60	27	87
Number of hybridized populations*	391	84	2	86
Proportion of Populations that are hybridized*	69%	58 %	7 %	50 %

** Conservation populations*

*** Genetically tested and found to be pure; or no evidence of hybridizing species present*

Based on the above information, cutthroat of the divide persist in substantially less of its historic range (8%) than what is observed range-wide (43%). There is less disparity when comparing the percent occupied range-wide with west of the divide. Approximately 31% (173 of 563) of existing populations occur within this analysis area. One quarter of the remaining populations are east of the continental divide.

Leary et al. (1997) found that 65 percent of the total measured genetic variation in the WCT genome is within WCT populations, 34 percent is among the populations themselves, and about 1 percent is between the aggregates of populations in the Columbia and Missouri River basins. Based on these and numbers in the table above, an estimated 11% of the genetic variation in the sub-species is found within this analysis area and about 8.5% is east of the continental divide.

Shepard et al. (1997) assessed extinction risk for 144 known populations, on federally managed lands, east of the Continental Divide, using a ‘customized’ Bayesian viability

assessment procedure. Results indicated 90% of the populations were at a high, to very high risk of extinction over the next 100 years. The viability analysis indicated the presence of non-native fish, livestock grazing, mineral development, and angling had the greatest relationship to the probability of WCT population persistence.

VIABILITY ANALYSIS

Risks and Threats to WCT

The risk ratings for WCT on the BDNF (Table 10) reflect significant differences between populations east and west of the continental divide. East of the divide, WCT exhibit highly variable recruitment and survival, declining population trends, depressed population levels, and extreme isolation. On the west side, most populations exhibit a migratory life history, are not nearly so depressed and occupy substantially more habitat. As such, the risks are substantially lower. On both sides of the Divide non-native trout have had substantial influences on WCT populations and are the primary reason for the high risk ratings east of the continental divide.

Table 10 Provides risk ratings and the reasoning behind them for WCT on the BDNF. The influence of non-natives is probably the most significant factor in every risk category and has played the most substantial role – by far- in defining the limited distribution of WCT and commonly depressed population levels.

RISK	GEOGRAPHIC AREA RELATIVE TO CONTINENTAL DIVIDE	RISK RATING FOR WCT ON BDNF	REASONS FOR RISK RATING
Highly Variable Recruitment or Survival	East	High	High degree of non-native influence resulting in extreme confinement of populations;
	West	Mod-Low	Moderate influence from non-native trout resulting in limited confinement of populations;
Declining Trend in Population	East	High	High degree of Non-native competition and hybridization; Potentially substantial effects from prolonged drought; Trampling of redds by livestock; some degraded habitats
	West	Mod-Low	Moderate degree of non-native competition and hybridization; Some effects from prolonged drought; Trampling of redds by livestock; some degraded habitats

RISK	GEOGRAPHIC AREA RELATIVE TO CONTINENTAL DIVIDE	RISK RATING FOR WCT ON BDNF	REASONS FOR RISK RATING
Depressed or Small Population Size	East	High	High degree of non-native influence resulting in extreme confinement in headwater reaches that have marginal habitats and growing seasons; Ongoing competition with brook trout; some degraded habitats
	West	Mod-Low	Non-native influence resulting in fewer instances of extreme confinement in headwater reaches with marginal habitats and growing seasons; Fewer instances of ongoing competition with brook trout; some degraded habitats
Population is Isolated	East	High	High degree of Non-native influence has resulted in loss of migratory life histories and the ability to exchange individuals in nearly all populations
	West	Mod-Low	Non-native influence has resulted in loss of migratory life histories and the ability to exchange individuals in some populations

Forest Plan Influences on Risks and Threats for WCT

The Aquatic Resources Management Strategy in the Preferred Alternative consists of four primary elements developed to help maintain species viability across the planning unit:

- Designation of 57 fish key watersheds for the purpose of ensuring conservation of our stronger WCT and bull trout populations, distributed forestwide;
- Designation of 15 restoration key watersheds, to emphasize aquatic restoration at the watershed scale.
- Implementation of a riparian conservation strategy (INFISH modified) for all streams forestwide. Modifications to INFISH were done to help clarify its intent, facilitate consistency in its application, reduce conflicts with recent policy and regulation decisions, and customize resource management objectives to improve its applicability to stream systems east of the continental divide
- A requirement designed to reduce the risk of aquatic nuisance species (ANS) introductions from new management actions.

These four elements are supplemented with additional direction fundamental to broader aquatic objectives, which will also contribute to conservation of sensitive species on the Forest.

Fisheries key watersheds are distributed across the BDNF, but are clumped in the Rock Creek Drainage. This aggregate is consistent with Rieman and Apperson (1989) who stated habitat management and protection should emphasize a system or drainage-wide approach, especially where migratory life histories are present. Our strongest populations remain in the Rock Creek drainage, where migratory life histories are prevalent and populations and habitats remain mostly connected.

In other areas, populations are primarily resident and isolated. There, single 6th field HUCs are large enough to ensure the maintenance of suitable conditions, while allowing for population expansion and recovery.

Table 11 displays management direction in preferred Alternative 6 and its effectiveness in mitigating land management actions on the BDNF with regard to westslope cutthroat trout. Non-native influences –hybridization and –competition are a significant threat for a large portion of the remaining WCT populations. Many of the remaining isolated populations are not threatened by hybridization, because they are above barriers to non-native fish movement. Many isolated populations, however, continue to be substantially impacted by brook trout competition, which is significantly influencing all four risks.

Brook trout are currently present and directly competing with about 2/3 of our populations. Thus, where land management actions have anything more than small impacts with relatively short duration, they risk contributing cumulatively to population risks and possibly to population level extinction.

Table 11. An evaluation of preferred Alternative 6's effectiveness in mitigating BDNF land management actions (threats) on westslope cutthroat trout; and the estimated level of impact to the species

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATION	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
Vegetation and Timber Management	Decrease in habitat complexity through sedimentation and loss of large woody debris; decrease in habitat quality through change in water temperatures; potential change in hydrograph; Possible contamination from spilling fuels	**Riparian Management Objectives** The RMOs in the Revised Plan apply by stream reach until new RMOs are developed through watershed or other site specific analysis, **Standard #1** Any activity in RCAs shall be designed to enhance, restore, or maintain the physical and biological characteristics of the RCA; **Standard #8** New projects will have a beneficial effect or no measurable negative effect on westslope cutthroat or bull trout in Fish Key Watersheds. **Standard # 25**: Project related storage of fuels and toxicants within Riparian Conservation Areas is prohibited. **Standard #26**;	No negative effect in fish key watersheds; no reduction in large woody debris or increases in temperature, due to RCA management direction, RMOs and stream-side buffers; no measurable sedimentation due to RCA management direction, RMOs and stream-side buffers; no negative changes in hydrograph; No contamination from fuel spills

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATION	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		Fuelwood cutting and salvage in RCAs will not prevent or retard attainment of desired stream function **Standard #27**; Vegetation and/or fuel management prescriptions in RCAs will be for the purpose of restoring, enhancing, or protecting the physical and biological characteristics of the RCA	
Wildlife Habitat Management	Positive influence on Habitat Quality; by reducing sedimentation; reduction in roads and trails	**Objective Roads**; Close and stabilize or obliterate and stabilize roads not needed for future management activities**.** beneficial if it occurs near WCT occupied stream	Beneficial, but limited in scope
Appropriate Management Response (Fire)	Decrease in habitat complexity Decrease habitat quality Sedimentation and changes in the temperature regime from fire and suppression activities. Direct mortality from retardant Direct mortality from wildfire; Possible ANS introductions	**Objective**: **Vegetation management**; Manage vegetation to reduce the risk of adverse wildfire impacts to isolated native fish populations. **Objective appropriate management response**. Suppression activities are designed and implemented so as not to prevent attainment of desired stream function, and to minimize disturbance of riparian ground cover and vegetation. **Objective: Temporary Fire Facilities :** Incident bases, camps, heli-bases, staging areas, heli-spots and other centers for incident activities are located outside of RCAs; **Objective Fire Suppression:** Chemical retardant, foam, or additives are not delivered to surface waters. **Standard 10:** If the only suitable location for incident bases, camps, helibases, staging areas, helispots and other centers for incident activities are within the RCA, an exemption may be granted following a review and recommendation by a resource advisor. **Standard #11** Monitor water quality and aquatic resources in fish key watersheds where chemical retardant, foam, or	Strategic fuel reductions in some areas where populations are considered at very high risk to effects from wildfire. Effects should be a benefit, but scope will be limited. Impacts to habitat from sedimentation and temperature elevation will occur. Objectives raise awareness and provide general direction to minimize impacts, but they will still occur intermittently forestwide related to fire patterns. Impacts should be relatively small and of short duration, because of Objectives and fire rehab and BAER actions. Mortality to individuals from retardant drops may still occur but on an infrequent basis and at a small scale. Potential for Extinction of isolated WCT populations will remain. The likely-hood remains relatively low, since it is uncommon to have

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATION	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		additives are delivered to surface waters. Monitoring should take place as soon as conditions allow for safe access. Other considerations: **The Beaverhead-Deerlodge NF Aviation in Briefing Booklet** contains the BDNF Aquatic Nuisance Species Prevention Strategy (ANSPS); Appropriate management response will often be guided by direction in a Fire Management Plan for that area. Issues specific to TES species will likely be considered in developing the plans.	extinctions, even where extreme fire behavior is extensive throughout drainage. Introduction of ANS can still occur, but direction to minimize risk is accepted and the procedures directed in the ANSPS are being implemented. Impact is that there will likely be mortality to individuals, but it will be infrequent and relatively small in scope. Habitat impacts will occur intermittently, but again scattered across the landscape over the planning period. Impacts from suppression should be short lived 0-2 years. Substantial impact to habitat quality and complexity might occur due to intense and large-scale fire behavior.
Recreation and Travel Management	.Potential Introduction of Aquatic Nuisance Species; Sedimentation to streams. Sanitary wastes into streams	**Objective: RMOs** guide management actions to achieve quantitative objectives; **Objective: Road drainage**; Reconstruct road and drainage features that …. are proven less effective than designed for controlling sediment delivery, or retard attainment of desired stream function, or increase sedimentation in Fish or Restoration Key Watersheds **Objective Roads**; Close and stabilize or obliterate and stabilize roads not needed for future management activities **Objective Recreation sites**: Recreation sites are adjusted if not meeting desired conditions; **Standard #1** New activities in RCAs maintain or improve the physical and biological characteristics; **Standard #2;** Evaluate risks of ANS introduction as part of project analysis; **Standard #18:** Where no alternative to placing facilities exists outside RCA avoid	Reduced risk of ANS introduction, but not eliminated. Sedimentation impacts from roads on some populations will be cumulative with other influences and will have a supporting role in maintaining populations at a suppressed level. Degraded conditions may favor brook trout where they are sympatric with WCT Recreation sites will be substantially mitigated probably within the life of the plan Evaluation of on ongoing activities fish key watersheds w/in 3 years and timeframes for implementing mitigations will be established.

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATION	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		impacts to RCA and Negative effects on fish. **Standard #19;** Solid and sanitary waste facilities in RCAs are prohibited; **Standard #23:** Terminate recreation activities that cannot be adjusted to be consistent with achieving desired stream function. **Standard #28;** Complete evaluations of ongoing activities in Fish key watersheds. Those inconsistent with goals and objectives will be identified within 3 years and timeframes for implementation of mitigation will be identified.	
Fire Management	Prescribed fire is done under a prescription, which minimizes risk of escape and allows the placement of treatment to be precise. There is some potential for escape but it is uncommon. Effects could be sedimentation and an increase in water temperature.	In Fish Key Watersheds; project will not occur unless beneficial or no effect (**Standard #8**); Outside Fish Key watersheds; will not occur w/in 300' unless beneficial or no effect **(Standard #1**)	Effects from Prescribed fire should be discountable
Livestock Grazing	Decrease in habitat quality; Grazing will maintain or increase amount of degraded habitat in some WCT streams; mortality of eggs and fry will occur in some streams.	**Objective: Spawning areas;** Reduce impacts from grazing practices in known or suspected threatened, endangered or sensitive fish spawning areas: **Standard #7** guidance defined in the Grazing Permit Administration Handbook will become mandatory rather than discretionary in Fish Key Watersheds when grazing is identified as a major contributor to degraded stream condition, and there is non-compliance with livestock grazing standards; or other aspects	Degraded habitats will tend to recover faster in fish key watersheds, but will not probably be fully recovered in some areas by the end of this planning cycle. Outside of fish key watersheds, effective implementation will occur at a rate that is consistent with what has occurred over the last 10 years. Impacts with regard to degraded habitat are cumulative and will have some role in suppressing

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATION	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		of livestock grazing permits terms and conditions.; **Standard 14**; Grazing practices that prevent attainment of desired stream function, or are likely to adversely affect threatened or endangered species, or adversely impact sensitive species, are modified; **Standard #15; :** Locate new livestock handling and/or management facilities outside of Riparian Conservation Areas; **Standard #16** Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that would not retard or prevent attainment of desired stream function; **Standard #28;** Complete evaluations of ongoing activities in Fish key watersheds. Those inconsistent with goals and objectives will be identified within 3 years and timeframes for implementation of mitigation will be identified.	population size; In some instances, population trend may be stable. In situations where habitat conditions are severely degraded and brook trout are competing with WCT, failure to implement effectively may have a cumulative effect in causing a downward population trend. Where livestock have access to, and are trampling a significant number of WCT redds this management action is likely reducing population size and may be causing a negative population trend. Where brook trout are competing with WCT and livestock have access to and are trampling more than a few redds, this action is probably contributing to a negative population trend.
Oil and Gas Leasing	Decrease in habitat quality primarily through sedimentation	NSO stipulations inside fish key watersheds; CSU outside fish key watersheds where conservation populations occur	No effect on WCT in fish key watersheds - protection should be adequate so that sediment effects on quality of habitat are minor and not measurable with regard to suppressing population numbers or creating a negative population trend.
Non-Native Influence	Decrease in habitat occupied; Decrease in available habitat; Decrease in distribution; loss of connected habitats; Mortality, loss of individuals;	**None** – The USFS does not manage populations, this is the State of Montana's responsibility **Other Considerations**: Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat trout and Yellowstone Cutthroat Trout in Montana 2007; under objective 1: Securing and enhancing populations will most frequently involve either limiting or removing non-native species, conserving or restoring habitat. MFWP is conducting Non-	Hybridization and competition are continuing. WCT populations will continue to decline and Extinctions will likely occur..

MANAGEMENT ACTION OR THREAT	MECHANISM OF AFFECT	MITIGATION	ESTIMATED LEVEL OF IMPACT WITH MITIGATIONS
		native removals a limited level, due to limitations in funding and man power. They are initiated and directed by Montana Fish, wildlife and parks. BDNF will assist in setting priorities and doing removal projects	
Aquatic Resource Management	Increase habitat quality; Increase Watershed Condition; Increase available habitat through non-native removal or removing fish passage barrier; prevent non-native influence through barrier placement;	**None** - beneficial	Habitat conditions will improve for some populations, due to the Aquatic focus on restoration. The WCT Conservation MOU, of which the Forest Service was signatory to is non-binding, but contains goals for WCT conservation and restoration actions that are equally shared by Montana Fish, wildlife and parks and BDNF. For this reason non-native removal, barrier placement and fish passage projects will occur over the next 10 years.

Table 12. An assessment of the effects of BDNF land management actions on westslope cutthroat trout, after implementing mitigations in preferred Alternative 6. Listed are the scope and duration of effects and whether they are likely to contribute to species risks or to population level extinction.

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	ESTIMATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
Vegetation and Timber Management	Very limited scope; Insignificant based on Mitigations in plan	Not applicable	There should be no contribution to risks or to population level extinction
Wildlife Habitat Management	Very limited scope because many will occur outside of areas influencing WCT;	Very long-term 40 – 100 years	There should be no contribution to risks or to population level extinction
Appropriate Management Response (Fire)	Limited scope, 5-10 populations because suppression will be more common than non-suppression and there is opportunity to include WCT concerns in a fire management plan. Wildfire can result in population extinction, but it occurs very rarely. Extinction from wildfire is not documented on the BDNF. The scope of wildfire extinctions is probably not more than 1 or possibly 2 populations within the planning cycle. The potential to mitigate this risk does not exist. Management can possibly reduce the potential for significant impact through fuel treatments in drainages with elevated risk of high intensity fires and isolated WCT. The scale of accomplishment and our inability to predict when and where fires will occur, however, probably doesn't allow	Fire suppression impacts on habitat: 3-10 years. Because of post fire rehabilitation and BAER actions. Wildfire impacts on habitat: Depending on severity; 5 – 40 years.	Fire suppression: Since impacts will be small and the duration of effects is relatively short, this action probably **Does not contribute to risks or to population level extinction:** Wildfire may have substantial population level effects and can even cause extinction. Since it is a natural event which, we cannot fully mitigate, the effects should be considered cumulatively with other management actions regarding WCT viability.

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	ESTIMATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
	fuels treatment to mitigate risk in the limited time frame of this planning cycle		
Recreation and Travel Management	Scope is probably moderate having notable influence on 10 to 20 populations	In fish key watersheds, probably 5 to 15 years. Outside fish key watersheds 15 to 30 years.	**depressed or small population size**. May cumulatively contribute to downward trend in some populations, most commonly, where brook trout are present. Effects in fish key watersheds should be effectively mitigated within the planning cycle. Outside fish key watersheds Risks will continue beyond the planning cycle. **Contributes to Risks and may contribute to population level extinction**
Fire Management	Very limited scope 0-5 populations; based on fact that primary objectives have been in uplands and limited funding and acres accomplished on the BDNF over last 10 years	Typically very short term for temperature elevation and sediment introduction	Fire Management will not contribute to risks or to population level extinction.
Livestock Grazing	Scope is extensive; 690 miles of WCT-occupied stream are in livestock grazing allotments. Effects on habitat are typically moderate to long-term 5 – 25 years; Mortality on fry and eggs occur on an annual basis. Effects are expressed for one generation and are thus short-term 3 – 5 years;	Effects on habitat are typically moderate to long-term where habitats are degraded 5 – 25 years; Mortality on fry and eggs occur on an annual basis. Effects are expressed for one generation and are thus short-term 3 – 5 years;	**Depressed or small population size and declining population trend.** Habitat quality effects in fish key watersheds should be effectively mitigated and well into recovery within the planning cycle. Outside fish key watersheds Risks will continue beyond the planning cycle. May cumulatively contribute to downward trend in some populations. **Depressed or small population size and/or declining population trend.** In some populations where brook trout are absent and in all where brook trout are present and competing with WCT, trampling of redds will likely contribute to a downward population trend. The cause of downward trend is direct

MANAGEMENT ACTION OR THREAT	ESTIMATED SCOPE OF EFFECT	ESTIMATED DURATION OF EFFECT	ESTIMATION AS TO WHETHER ACTION CONTRIBUTES TO RISKS OR TO POPULATION LEVEL EXTINCTION
			mortality to individuals and (because of differences in the timing of spawning between brook trout and WCT,) livestock management will select for brook trout over WCT. Trampling of redds will be mitigated in fish key watersheds within 5 years and forestwide within 10 years. **Contributes substantially to risks and may contribute to population level extinction**
Oil and Gas Leasing	Scope is very limited 0-5 populations, based on oil and gas activities over the past 15 years;	Effects from oil and gas are moderate to long term 5 – 25 years	Will not contribute to Risks or to population level extinction.
Non-Native Influence	Scope is extensive; Impacts from non-natives are considered very long term 40-100 years, because there is no efficient or effective way to eliminate non-natives at the scale of our planning unit;	Impacts from non-natives are considered very long term 40-100 years, because there is no efficient or effective way to eliminate non-natives at the scale of our planning unit;	**Contributes substantially to all 4 Risks and to population level extinction**
Aquatic Resource Management	Scope is limited to moderate 10 – 20 populations. Habitat improvements will occur much more frequently and at a larger scale because of aquatics focus. (measured with regard to all degraded habitat restored or available habitat increased or non-native impacts removed to an extent population is secured.	Improvements should be very long term 40-100 years.	Will not contribute to risks or to population level extinction. Effects will be beneficial in securing populations.

Westslope cutthroat Viability Conclusions

Table 12 displays the management actions or threats that are likely to contribute to WCT population risks and/or population level extinctions. These include Non-native trout influences, Livestock grazing and recreation and travel management.

Non-native trout hybridization and competition are the most significant factors in every risk category influencing WCT. They have been a dramatic catalyst in past WCT extinctions, and in suppressing WCT populations and shaping current WCT distribution. If non-native influences could be immediately removed from the analysis area, WCT populations would immediately begin expanding and the risks of population level extinctions would largely disappear. Conversely, if all impacts from roads and livestock grazing were immediately removed, risk of extinctions would persist and populations would likely still be lost. This is important in understanding the extent to which WCTs status and distribution, in combination with non-native influences are increasing the significance of management impacts.

After considering mitigations in the preferred alternative, livestock grazing and recreation and travel management are actions that will act cumulatively with non-native influences and contribute to risks regarding WCT viability. However, the direction for emphasis of watershed scale restoration provides encouragement that opportunities and funds for correcting road related problems will be more available than in the past. The scope of effect between roads and livestock grazing are different and livestock management (without complete exclusion) does not lend itself to correcting stream impacts as quickly as can occur when mitigating road related impacts. Thus, livestock impacts related to degraded habitats will probably persist longer and have an increased likelihood of contributing to population loss.

The significance of degraded habitat is magnified by the presence of brook trout and could be substantial in isolated populations that occupy short reaches of stream. Degraded habitats can increase the competitive advantage of brook trout to the extent that WCT displacement occurs. Extended drought conditions on the Forest may also be favoring brook trout. A number of our isolated populations on the BDNF appear to be experiencing declines in population numbers. Progressive invasion by brook trout toward the headwaters of drainages have been observed in several locations. This is likely occurring in more populations than we've observed, since we have limited capability to monitor all populations frequently. The rate of invasion appears to have accelerated in the last 10 years, possibly the result of drought changing temperature regimes.

Brook trout are currently sympatric with about 2 out of 3 WCT populations forestwide, so the scope of brook trout and cumulative management impacts is substantial. The plan addresses ongoing activities in Fish Key watersheds, by requiring that they be evaluated to determine effects on WCT and bull trout within 3 years (of the signing of the revised plan). It requires that a schedule be developed for implementing mitigation actions to alleviate impacts. It does not, however specify a time within which all actions have to be completed. The Determination in this BE for WCT is based on the assumption that mitigations will be implemented within 5 years in fish key watersheds and within 10 years outside fish key watersheds. If these timeframes are not met, then the Determination should be revisited.

The scope and intensity of impacts on WCT from recreation and travel management probably tend to be substantially less than those from livestock grazing. This is deduced from data gathered over the last 3 years on the BDNF, which indicates that an average of 70% of WCT redds are likely being trampled in suitable rangelands if cows are grazing adjacent riparian areas. It is also likely that many redds are being trampled multiple times. Roberts and White

(1992) documented that substantial mortality can be incurred from humans walking on trout redds. Since the level of foot loading in cows is greater than in humans, mortalities from livestock trampling would be at least as high as those observed in the 1988 study. The mortality incurred in populations that are already at risk is in some cases probably responsible for initiating or increasing a negative population trend. Based on these considerations, it seems more likely that unmitigated livestock grazing could contribute to the loss of a population.

In the last 10 years, our data indicate two WCT populations have been lost. One appears to have been due to brook trout competition, the other because the occupied stream reach went dry. Because management impacts from livestock grazing will continue at their current level for well beyond 5 years for many WCT populations, there is a possibility these actions could contribute to the loss of populations. There is less risk of loss in fish key watersheds because mitigations will be implemented sooner than in other locations. Based on the scope of impact there is a higher likelihood that livestock grazing could contribute to the loss of a population.

This Biological Evaluation must reach one of several possible determinations. They are:

- 1) No Impact;
- 2) Beneficial Impact;
- 3) May impact individuals, but will not likely contribute to a trend towards federal listing or reduced viability for the species; or
- 4) Will impact individuals or habitat with a consequence that the action may contribute to a trend toward federal listing or cause a loss of viability to the population or species.

Under the preferred alternative, livestock grazing will inevitably impact individuals with the consequence the action may contribute to loss of viability to one or more populations. It is doubtful however, it will contribute to a trend toward federal listing or to loss of viability across the planning unit.

In addressing the significance of 457 of the 563 WCT populations being isolets and restricted to headwater reaches, USFWS in its August 7, 2003 finding indicated fragmentation was not a significant risk to species viability. It states …"the small WCT populations in headwater areas were numerous but they occupied a small proportion of the total habitat occupied by WCT. Most of the occupied stream miles (88.5 percent) were habitat for WCT in metapopulations. Consequently, the best scientific and commercial information available to us indicates that the WCT subspecies is not threatened by the fragmentation and isolation of small WCT populations in headwater areas."

In addressing threats from brook trout it also states: "it is evident from their longstanding coexistence in some streams that complete competitive exclusion of WCT by brook trout is not inevitable where the two fishes co-occur. In addition, the database did not provide conspicuous insights into how far upstream brook trout may eventually move in the various drainages in which they now occur. Nonetheless, as we will describe, the available scientific information indicates brook trout are not a substantial threat to the majority of extant populations constituting the WCT subspecies."

In addressing threats from stochastic events it states: "The widespread geographic distribution of WCT across the subspecies' range further mitigates potential negative effects resulting from local population extinctions following future catastrophic natural events, as no single event is likely to impact a significant percent of the overall number of isolated populations. Moreover, given the widespread efforts for the conservation of these fish (*see* ''Evaluation of Ongoing Conservation Efforts,'' below), any such local extirpation is likely to be followed by reintroduction efforts if WCT were not available naturally to re-colonize those habitats."

The only conclusion that can be made from these and other statements in the finding is that population losses will not constitute a threat to the subspecies unless a substantial portion of its range or distribution is affected.

The significance of individual populations relative to distribution, could change within the perspective of ESA, if the geographic area considered for listing WCT was reduced substantially. However, this was addressed in the finding also. It stated: "While conducting the new status review for WCT, we found no compelling evidence for recognizing distinct population segments of WCT. Instead, for purposes of the new status review, we recognize WCT as a single taxon in the contiguous United States"

If we consider the legal requirement under NFMA relative to the current status of WCT across the BDNF, the finding relative to the loss of a few populations cannot be substantially different from the USFWS 2003 Finding.

Our isolated populations are the ones at greatest risk. As stated above the average length of stream occupied east of the continental divide (where nearly all populations are isolated) is 4.4 miles. The loss of 2 populations (equal to the number lost in the last 10 years) could conceivably be projected to be a reduction in WCT distribution of 9 miles out of 1280 within the analysis area. The rationale in the finding would suggest, this is not substantial enough to threaten WCT viability and it suggests there is a high likelihood the populations would be restored to result in no net loss.

The Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana (MCTSC 2007) states under Objective 3: "Efforts will be made to re-establish cutthroat trout populations within their historical range. These efforts may involve expanding existing populations or establishing "new" populations, primarily through translocation"

The 1982 planning rule - Section 219.19, Fish and Wildlife Resources, stipulates:

> *Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure itscontinued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.*

The aquatic resources conservation strategy and specifically our designation of fish key watersheds is consistent with the best available science. Key watersheds were designated because they met criteria that indicated they were the strongest populations, representing migratory and resident life histories while being well distributed forestwide. They represent a substantial proportion of the remaining WCT populations forestwide and provide the foundation for maintaining this species' viability across the planning unit. If populations are lost they most likely will be outside fish key watersheds, so WCT will remain well distributed.

Based on this, the 173 populations across the analysis area are currently well distributed and will remain so. The distribution is not substantially different in appearance from that for the subspecies range-wide. Habitat is provided to support a minimum (adequate) number of reproductive individuals. Many of the populations across the planning area are isolated, and cannot interact with other populations. However, the isolation has nothing to do with habitat provided by the Forest. As stated earlier in this document, the forest provides abundant habitats that are connected throughout. The isolation is due to non-native hybridization and competition excluding WCT from significant portions of its historic range.

Even so, nearly all of the populations on the BDNF, exhibiting migratory life histories are contained in the fish key watersheds in the Rock Creek drainage. These watersheds encompass a broad geographic area and contain approximately 40% of the stream miles occupied by WCT on the BDNF. The populations in these watersheds have retained migratory life histories because they can still move freely within the system and the habitats allow interaction between populations. These watersheds were designated as "key" specifically so stringent management direction would ensure we maintain connectivity and the ability for individuals to interact between populations in the best and largest area we can provide on the BDNF.

Considering all of the information above, my determination for WCT relative to management direction in Alternative 6 of the Revised Forest Plan is:

Will impact individuals or habitat with a consequence the action may contribute to a trend toward, or cause a loss of viability to a population.

However, the action will not likely contribute to a trend towards federal listing or reduced viability for the species across the planning unit.

Determination Summary

	Northern Leopard Frog	Boreal Toad	Grayling	Westslope** Cutthroat Trout
DETERMINATION	NI	MIIH	MIIH	WIFV

** *See discussion and explanation for call on previous page*

Sensitive Species Determinations

NI = NO IMPACT

MIIH = MAY IMPACT INDIVIDUALS OR HABITAT, BUT WILL NOT LIKELY CONTRIBUTE TO A TRENDS TOWARDS FEDERAL LISTING OR LOSS OF VIABILITY TO THE POPULATION OR SPECIES.

WIFV = WILL IMPACT INDIVIDUALS OR HABITAT WITH A CONSEQUENCE THAT THE ACTION MAY CONTRIBUTE TO A TREND TOWARDS FEDERAL LISTING OR CAUSE A LOSS OF VIABILITY TO A POPULATION OR SPECIES.

BI = BENEFICIAL IMPACT.

Signature

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Date: November 22, 2008

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