Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement

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Background and Purpose

The State of Montana, through a joint effort by the Department of Fish Wildlife and Parks (FWP) and the Natural Resource Damage Program (NRDP), developed this prioritization plan to help guide the state's fishery restoration efforts in the Upper Clark Fork River Basin (UCFRB) that are being funded by natural resource damage settlement funds. In 2008, the state concluded its third and final settlement of its natural resource damage litigation against ARCO for injuries to natural resources in the UCFRB caused by the release of hazardous substances from past mining and mineral processing activities by ARCO and its predecessors.[1] The injured Silver Bow Creek and the Upper Clark Fork River mainstem fisheries were the focus of the state's aquatic resources damage claim in this lawsuit. This plan integrates with and builds on the state's remediation and restoration efforts that have been or will be conducted along the mainstems of Silver Bow Creek between Butte and Warm Springs Ponds and Reach A of the Upper Clark Fork River between Warm Springs Ponds and Garrison with dedicated settlement funds to these mainstem areas (Map 2). It identifies the most important stream areas in the Basin to focus fishery habitat protection and enhancement efforts to augment the mainstem remediation and restoration efforts already conducted or planned.

The primary objective of the state's aquatic restoration efforts in the UCFRB funded with natural resource damage settlement funds is to restore fishery resources and associated angling opportunities in Silver Bow Creek and the Clark Fork River to the baseline condition that would exist absent the release of hazardous substances from historic mining and smelting activities in the Butte and Anaconda areas. The secondary objective is to replace lost fish and angling opportunity off-site when on-site (mainstem) restoration is not possible or not cost-effective. Off-site locations considered in this document include tributaries to Silver Bow Creek and the Clark Fork River above the confluence with the Blackfoot River. Restoration of fisheries relies on effective cleanup of metals contamination along the mainstems. Without this, enhanced biological and physical conditions will not achieve significant benefits. There are instances, however, when off-site replacement activities may be more cost-effective than on-site restoration activities. This is especially true where fish populations use the tributaries for their entire life cycle including spawning, rearing and refugia. Where fish from populations use the mainstem for part of their life cycle, enhancement of these populations will depend on a healthy Clark Fork River or Silver Bow Creek. Addressing important tributary habitats, in combination with mainstem habitats, can accomplish further recovery of the mainstem fisheries than would otherwise occur with restoration activities confined to mainstem or tributary areas alone. A combination of restoration activities on the mainstems and

[1] Background information on this litigation is available from the NRDP's website at: http://doj.mt.gov/lands/naturalresource/

replacement activities in priority tributary areas will enhance the river ecosystems and fisheries in the UCFRB in the most beneficial and cost-effective manner.

This document is intended to direct collaborative efforts by the state and other entities to areas of the UCFRB that are most likely to contribute to fishery goals. It also serves to identify areas to avoid. In effect, it directs habitat protection and enhancement efforts where they will be more biologically and cost effective, rather than driven by the opportunity for a project, which often results in secondary consideration of fishery goals. Further resource assessment, project identification, and project proposal development can be targeted to the identified priority areas, allowing for more effective funding decisions and project development than would otherwise occur without this prioritization. This prioritization process is a parallel and complementary effort to the terrestrial resource prioritization effort also being conducted by FWP and NRDP.

We do not provide project-level priorities. Instead, when encountered, we noted habitat degradation. Further assessment is needed to determine if the degradation is a limiting factor to a fishery, how the degradation should be addressed, and the feasibility and cost of project implementation.

The document first addresses mainstem priorities (Section A) and second, tributary priorities (Section B). It next describes strategies for habitat protection and enhancement (Section C) and fishery management (Section D) to best accomplish these mainstem and tributary priorities. The remaining sections address important considerations to the prioritization process (Section E), monitoring (Section F), and public participation (Section G).

A. Mainstem Priorities

Restoring the mainstem fisheries of the Clark Fork River and Silver Bow Creek is the primary focus of the state's aquatic restoration efforts in the UCFRB. The Silver Bow Creek and Upper Clark Fork River mainstem areas are the focus of remediation and restoration activities that have been or will be funded with dedicated, site-specific settlement funds. The bullets below summarize these activities, which are mainly focused on reducing metals contamination within the floodplain, and associated dedicated funding.

- Silver Bow Creek: Pursuant to the 1999 settlement/consent decree that provided $80 million, plus interest, in funding for remediation of Silver Bow Creek, the Montana Department of Environmental Quality (DEQ) is conducting remedial actions along the creek corridor. DEQ's remediation work primarily involves excavation of tailings and related impacted soils from the floodplain of Silver Bow Creek and reconstruction of the stream channel and floodplain. Since remediation activities began in 1999, about 4

million of an estimated 4.7 million cy of tailings (about 80%) have been removed from the Silver Bow Creek floodplain corridor and 14 of 24 stream miles have been reconstructed. Restoration activities that enhance the fish and wildlife habitat along the creek are being conducted in coordination with the remediation work via natural resource damage grants totaling $15.5 million to the Greenway Service District for the Silver Bow Creek Greenway project. These restoration activities primarily enhance fisheries habitat by augmenting riparian vegetation and instream aquatic habitat. The Greenway project also involves the development of a passive-use recreational corridor along Silver Bow Creek that will enhance public fishing access. The state expects to complete remediation and restoration of injured floodplain areas in about 3 years. In addition to the completed and planned remediation and restoration activities along the mainstem of Silver Bow Creek, the planned remediation of the upgradient Butte Priority Soils Operable Unit site entails surface water runoff collection and treatment activities that will improve the aquatic resources of Silver Bow Creek.

- Clark Fork River: The 2008 settlement/consent decree provided the state with $95 million, plus interest, for the remediation of the Upper Clark Fork River and $26.7 million, plus interest, for restoration activities. The DEQ will conduct the remediation activities that primarily involve removal of contaminated tailings from areas generally devoid of vegetation, treatment of other contaminated soils with lime and deep tilling, and stream bank reconstruction, primarily in Reach A from Warm Springs to Garrison. The NRDP will conduct restoration work that will be integrated with remediation activities and enhance fishery habitat, primarily through additional tailings removal and additional riparian vegetation activities (organic matter, grasses, trees, and shrubs) to augment remediation work. The state's Restoration Plan also provides for acquisitions/easements in the upper Clark Fork River riparian zone, when feasible based on landowner agreements. The Plan also contemplates the state's acquisition of some of ARCO's water rights that would provide for flow augmentation of up to 40 cfs for instream flow on Warm Springs Creek to the confluence of the Clark Fork River, and additional instream flow in Lost Creek and Dutchman Creek. The state anticipates remediation and restoration work of the Upper Clark Fork River to be completed in the next 10 to 12 years.

In addition to looking to the tributaries to help restore mainstem fisheries (see next section), we looked at what additional measures along the mainstems, beyond those already conducted or planned and funded as described above, were needed to restore the Clark Fork River and Silver Bow Creek fisheries. Major habitat needs include cleanup of metals pollution, reducing nutrient loading, and increasing instream flows. Of these three needs, we identified increasing instream flows as a priority. Improving tributary habitat alone will not be enough to restore the

mainstem fishery if the habitat in the mainstem is degraded. Furthermore, instream flow is beneficial in many ways. Besides being the basic component of fish habitat, water also aids in the moderation of water temperature and dilutes nutrient and metals loads, each being critical to improving trout habitat in the UCFRB. Other aspects of habitat for the mainstems, such as riparian enhancement and protection and fish passage at irrigation structures, are not addressed in this prioritization, as further progress on the mainstem remediation and restoration activities is needed to fully understand the need for or value of such projects.

Minimum flow needs were addressed by the Upper Clark Fork Basin Steering Committee (2006). Using FWP's wetted perimeter analysis, minimum flow targets were established for portions of the mainstem Clark Fork River that are chronically dewatered. The area from the confluence of Warm Springs Creek to Deer Lodge was identified, and target minimum flows of 40 cfs at Galen and 90 cfs at Deer Lodge were established. The need for water is primarily in the summer between July and September. Using this recommendation, the state proposed a 50 cfs flow augmentation in the Clark Fork River from Galen to Deer Lodge (Map 3) in its Clark Fork Restoration Plan (NRDP, 2007). Although a similar analysis has not been conducted to determine minimum flow needs on Silver Bow Creek, we know qualitatively that increased base flow could greatly improve the ability of Silver Bow Creek to support trout populations.

Instream flow projects were of highest priority in reaches where water quantity was considered inadequate for supporting a healthy fish population. Therefore, the area of the Clark Fork from Warm Springs Creek to Deer Lodge is emphasized. Instream flow outside of this area on the mainstem Clark Fork River or on Silver Bow Creek could also be a priority and should be assessed case-by-case. Furthermore, the addition of cold, clean water to the mainstems from tributaries could provide significant improvement in mainstem fishery habitat depending on the quantity, timing, and distance the water remains in the river or creek channel. Therefore, tributary instream flow projects that benefit the mainstems flow are also considered to be a high priority. Potential future instream flow projects on both the Clark Fork River and Silver Bow Creek are recognized as Priority 1 or Priority 2 in Table 2 of this Final Plan document.

B. Prioritization of Tributaries

In anticipation of the completion of the state's natural resource damage lawsuit, FWP and the NRDP began a basin-wide assessment of UCFRB tributaries in 2007. We initiated this assessment in order to obtain sufficient information to identify where aquatic restoration efforts in the Basin tributaries could best augment the restoration work completed or planned for the mainstem of Silver Bow Creek from Butte to Warm Springs Ponds and the Upper Clark Fork River between Warm Springs Ponds and Garrison (Reach A and SBC). Little information was available regarding fishery resources in UCFRB tributaries, and what knowledge existed was of limited scope.

This prioritization uses information obtained from assessments of fish populations, riparian condition and stream habitat quality conducted primarily in 2007 and 2008 in tributary streams to the Upper Clark Fork River from Deer Creek near Bonner to Blacktail Creek, a tributary to Silver Bow Creek near Butte (FWP, 2008 and FWP, 2009). In addition, this prioritization relies on an assessment of fishery habitat conditions in eight tributaries (Workman, 2009) as well as a planning effort completed by the NRDP in 2005 to prioritize restoration of natural resources in the Silver Bow Creek watershed (NRDP, 2005).

The various data assessments were not exhaustive. Furthermore, our method of sampling discrete sections of the tributaries is not a comprehensive assessment for each watershed and, therefore, is limited in identifying limiting factors and effects of watershed processes on the more local habitat condition that were sampled. More fishery information has since been collected. In 2009, FWP conducted sampling of the Upper Clark Fork River from Warm Springs to Turah to better understand the current status of the mainstem fishery and initiated a basin-wide radio telemetry study (FWP, 2008 and Mayfield and McMahon, 2010) to help identify important resource areas. Surveys of irrigation structures are being conducted in the Upper Clark Fork drainage to assess effects on native fishes (FWP, 2010). FWP also sampled more Basin tributary sites in 2009 to supplement the 2007-2008 data. The compilation and assessment of information gained from 2009 tributary sampling has partly been completed, with the inclusion of some of the areas near Butte. Other data from 2009 remains to be analyzed. Incorporating this additional assessment information and future assessment information will likely alter priorities and help better define needed work. Nevertheless, the data compiled and assessed to date and used in this prioritization process are valuable in directing attention to some areas and away from others, as well as in providing initial habitat information that can be used for subsequent project development.

Fishery Goals for Tributary Prioritization

This tributary prioritization was undertaken to communicate where opportunities for fishery habitat protection and enhancement activities should be pursued in the UCFRB tributaries to best achieve one or more of the following fishery goals (see map #1):

1) Restore the mainstem trout fishery by improving recruitment of fish from tributaries;
2) Replace lost trout angling in the mainstem by improving trout populations in tributaries; and
3) Maintain or improve native trout populations in the UCFRB to preserve rare and diverse gene pools, and improve the diversity and resiliency of the trout fishery.

These goals are not mutually exclusive. Progress towards meeting one goal will often contribute towards another. For example, improving tributary fisheries (goal 2) will often

improve mainstem fisheries (goal 1) and vice versa. Conversely, progress towards any goal will not be to the detriment of another. For example, efforts to improve recreational fishing (goals 1 and 2) will not be to the detriment of native trout populations (goal 3). Maintaining or improving native trout populations (goal 3) is not independent of other goals. For example, native westslope cutthroat trout provide angling opportunity as well. We recognize that protecting native fish besides just native trout is important, too. However, we use native trout as a surrogate for native fish communities because they serve as indicator species and we have limited information regarding other fishes. Finally, although enhancement of trout populations is the focus of these goals, trout are likely to be a good indicator for other aquatic resources, such as aquatic insects.

Tributary Assessment Methods

Trout populations were surveyed in the tributaries to assess the value of the fisheries for meeting the goals of the program. More specifically, surveys provided information such as fish species composition, distribution, abundance and size composition. Trout populations vary between streams and often within a stream, so extensive sampling was needed to characterize the Basin's tributary fisheries. This information allowed us to evaluate the value of an area for providing fish to the mainstems, providing a fishery on its own, and as a native trout fishery.

Field survey methods for the Upper Clark Fork River tributaries are described in the data summary reports (FWP, 2008 and 2009). In short, most fish population surveys included single pass electrofishing at sites along the length of each tributary. Trout population estimates were completed at some sites to better quantify fish numbers and begin trend monitoring. Qualitative riparian and instream habitat assessments were completed following procedures developed by the NRCS (NRCS, 2005). Important habitat features and watershed conditions, including factors affecting fish and their habitat (e.g., fish passage barriers and water quantity and temperature) were also noted. In total, over 280 sites in more than 140 areas were surveyed. Workman (2009) provides another assessment of eight select tributaries. His assessment methods differed from the larger effort but overlapped in some areas. The Silver Bow Creek assessment (NRDP, 2005) involved the compilation of available fishery population and habitat information but did not involve the collection of new field data.

Tributary Prioritization Methodology

Using the fishery and habitat assessment information, the state prioritized tributary areas through three main steps: 1) valuation of the current fishery of each area; 2) valuation of the potential benefits of habitat protection and enhancement projects in an area; and 3) determination of priority areas based on applying NRDP policy preferences to the results of steps 1 and 2 (see FWP and NRDP, 2010 for summaries of information used for valuations of

each tributary area). Values considered how important an area is to achieving the three fishery goals from a biological standpoint. Professional judgment was necessary because the quantity and quality of the data varied between locations. However, we did provide comparable ratings across the Basin.

Step 1. Valuation of the current fishery

We evaluated the current condition of each tributary fishery with regard to the three fishery goals. The goals address the Upper Clark Fork River and the Silver Bow Creek mainstem fisheries separately and equally since currently they are discreet fisheries due to the configuration of Warm Springs Ponds. To standardize this evaluation, we considered the following attributes of the trout populations (see Table 1 also).

1) **<u>Value as a Recruitment/Restoration Fishery for the Upper Clark Fork River or Silver Bow Creek</u>:**

   Species Present: Trout species present in a tributary stream or reach. This considers the propensity for a species to migrate from a tributary and use the Upper Clark Fork River or Silver Bow Creek, as well as a species' relative value to anglers (i.e., size, species composition, and catchability).

   Fish Density/Number of Fish Produced: The relative number of trout present in a tributary stream or reach that are potentially available for recruitment to the Upper Clark Fork River or Silver Bow Creek.

   Recruitment to and Connectivity with the Upper Clark Fork River or Silver Bow Creek: The ability of juvenile and adult trout to migrate between a stream or reach and the Upper Clark Fork River or Silver Bow Creek.

2) **<u>Value as a Tributary/Replacement Fishery</u>:**

   Recreational Species Present: Trout species available to anglers in a stream or reach. This considers important characteristics of a species to anglers, such as size and catchability, and diversity of species.

   Fish Density: The relative number of fish available to anglers in a stream or reach.

   Fish Size: The average and maximum size of trout available to anglers in a stream or reach.

   Recruitment to non-Upper Clark Fork River or Silver Bow Creek Fishery: The importance of the tributary or reach in providing trout to a stream fishery other than the Upper Clark Fork River or Silver Bow Creek. In other words, if a stream or reach is not important itself as a

sport fishery, does it provide trout recruitment for another water body (e.g., tributaries to Warm Springs Creek or Rock Creek)?

3) **<u>Value as a Native Fishery</u>**:

Native Species Present: Trout species present in a stream or reach that are indigenous to the region. This considers the presence of bull trout and westslope cutthroat trout and their genetic status. For the purposes of this initial prioritization, we used native trout as an indicator of health of the native fish assemblage, assuming that trout species were the most likely to be affected.

Competitor and/or Hybridizing Species Present: Trout species present in a stream or reach that are not indigenous to the region, and that could potentially compete or hybridize with native trout species. This considers the presence and abundance of brown trout, rainbow trout, brook trout, and hybrid individuals formed when these species spawn with native trout species.

Demographics and Connectivity: The size and age structure of the population in a stream or stream reach, and the tendency of individuals within the population to migrate. In addition, the ability of juvenile and adult fish to move to and from the subject stream or reach provided the population exhibits a migratory behavior.

The current value of trout populations in tributary streams or stream reaches was rated as very high, high, medium, low, or very low. The ratings were relative to other fisheries, not a rating of potential for a stream or stream reach. For instance, a very high rating does not indicate that a stream has reached its potential. We standardized current fishery value ratings, by goal, as shown in Table 1. The Tributary Area Summaries[2] indicate these fishery population attributes and the resulting current fishery value ratings for each area.

Step 2. Valuation of Habitat Protection and Enhancement

We next judged the value of protecting or enhancing fishery habitat in tributary areas using results of the current fishery valuation and habitat assessments. We define protection and enhancement as follows: Protection is the act of maintaining the fishery value of the area, typically through protection of the habitat; and enhancement is the act of improving the fishery value of the area, typically through restoring watershed processes and improvement of the habitat.

[2] *Upper Clark Fork River Basin Tributary Area Summaries, May 2010*, Montana FWP.

Habitat assessments were used to evaluate habitat quality and security associated with fish populations. They are defined as follows:

Habitat Quality: A qualitative evaluation of a stream or reach having the necessary physical components to allow trout to carry out their natural life cycle and support viable populations.

Habitat Security: A qualitative evaluation of whether a stream or reach is vulnerable to ongoing or future habitat degradation based on land use and ownership.

Factors affecting fish habitat were identified when encountered. However, habitat assessments were not comprehensive and often limited to site-specific evaluations and done with incomplete knowledge of watershed-wide conditions. As a result, some areas only have a description of the habitat whereas others have more detail on processes causing habitat degradation and possible limiting factors to the fishery. Habitat security was largely based on land ownership and the protection it may provide from habitat degradation. Easement information was not researched.

Each area was assigned a protection and enhancement value rating for each of the three goals. This rating reflected the value that a habitat project could have in helping achieve the fishery goals and was based on available information. In general, we assumed that the value of enhancing fish populations was reflected by the current fishery value. We varied from current fishery value in some instances: 1) Where there was evidence that habitat enhancement or protection could significantly enhance the current value (e.g., there were identified limiting factors), 2) There was possible future degradation of the fishery (e.g., residential development or hybridization appears imminent), or 3) Habitat protection was of higher or lower value than the current value (e.g., lands were either highly developable or much less developable because of public land ownership). We made no assumption about the opportunity to implement projects; therefore our rating does not address the availability or quality of specific projects. Ratings were very high, high, medium, low, or very low. The Rating Summaries (FWP and NRDP, 2010) indicate the habitat quality and security attributes and the habitat protection and enhancement value rating for each goal in each tributary area.

Step 3. Prioritization of tributary areas

Step 3 started with the narrowing down of potential tributary priority areas to only those areas that had a habitat protection and enhancement priority rating of very high or high for one or more of the three fishery goals. Of the 145 tributary areas assessed, 103 met this criterion. We next incorporated the priority for restoration of injured resources that is reflected in NRDP

program policy and criteria[3] using the methodology indicated below. This resulted in the identification of 59 priority areas, which were categorized from 1 to 4; with 1 being the highest priority and 4 the lowest (table 2 and map 3). All 59 areas listed are priority areas and seeking protection and enhancement projects in these areas is encouraged. Another 35 areas have been assessed but prioritization is pending (see list at the end of this document and map 3). The remaining 86 areas are not considered to be a priority. The prioritization process factored in the following three preferences:

1) Projects that occur in Reach A of the Upper Clark Fork River (from Warm Springs Ponds to Garrison) and Silver Bow Creek, then Reach B of the Upper Clark Fork River (from below the Little Blackfoot River to just below the confluence with Flint Creek) and lastly Reach C of the Upper Clark Fork River (from below the confluence with Flint Creek to above the confluence with the Blackfoot River). Reach A and Silver Bow Creek includes the mainstems and drainage of Silver Bow Creek and the Upper Clark Fork River from the Warn Spring Ponds to Garrison. (Map 2)

2) Projects that help achieve fishery goals 1 and 2 (see page 1): restoration of the mainstem fisheries by improving recruitment to the mainstem from tributaries, and replacing lost angling opportunities in the mainstem by improving angling in the tributaries.

3) Projects that protect or enhance high quality, native trout populations and those known to use the mainstems.

To address preferences 1 and 2, the prioritization of areas was further filtered to emphasize areas in Reach A and Silver Bow Creek that meet fishery goals 1 and 2. As such, areas in Reaches B and C and areas that contributed only to the native fish goal (fishery goal 3) were de-emphasized. Preference was for areas that addressed fishery goals 1 and 2, then areas that addressed goals 1 or 2, and least for goal 3 (see map 3 and Table 2).

Preference for fishery projects in tributaries to up-river reaches of the Clark Fork is based on the belief that more of the Upper Clark Fork fishery will benefit from projects higher in the drainage for the following reasons. This area has had most of the ecosystem damage, so projects in upper reaches are more likely to directly address the damaged fishery resource. Also, we believe that trout spawned in tributaries higher in the drainage are more likely to contribute angling opportunity in the Upper Clark Fork than trout spawned in the tributaries lower in the drainage. We expect trout hatched higher in the drainage will contribute to fish

[3] The priority for restoration of injured resources is reflected in several of the funding criteria for NRDP projects specified in the UCFRB Restoration Plan Procedures and Criteria (NRDP, 2007).

populations and angling by either staying in the tributary or by migrating to the Clark Fork but staying in the Upper Clark Fork River drainage (i.e., above the Blackfoot River). Current fish tagging projects are likely to help with this assumption.

Prioritizing projects in areas that address both goals 1 and 2 are preferred until it is more certain how well the Upper Clark Fork River and Silver Bow Creek can support a trout fishery, since the primary goal is to restore these mainstem fisheries. Conducting projects in areas that could provide both a local, tributary fishery and recruitment to the mainstem fisheries would reduce the risk of doing projects that are of limited benefit if increased recruitment of young trout to the mainstem fisheries proves in excess of what the habitat can support. Reduced emphasis for goal 3 resulted in removal of areas with a) no bull trout or with a bull trout population of questionable viability (e.g., rare abundance or hybridized) and b) genetically pure westslope cutthroat trout populations with low density, or higher density but not connected to the mainstems. Of the 59 priority areas, 33 have high or very high priority for native trout, and 48 have medium priority or higher. This shows that native fish areas are a prominent part of the prioritization, and these areas are contributing to goals 1 and 2 as well. In addition, those areas with a high or lesser value for only goal 3 are, by definition, biologically or physically removed from the mainstems. Therefore, removing these areas from the priority list maintains the program focus on restoring the mainstem fishery and ecosystem and maintaining a reasonable number of areas that made the final priority list.

Included as priorities are areas with viable bull trout and westslope cutthroat trout populations that typically have higher densities of fish and diverse life histories including biological connection (i.e., migration to and from) with the mainstem waters. In addition, some of the higher quality areas with limited connectivity with the mainstem were elevated in priority throughout the basin due to their importance as native fish strongholds. More specifically, the complex of streams in upper Warm Springs Creek (including Storm Lake, Barker, W.F. Warm Springs, Twin Lakes Creeks) and Harvey Creek. These areas are unique in that they are physically isolated by a barrier or distance. We hope that giving priority to such areas contributes to the persistence of native fish populations by maintaining genetic diversity and source populations of native fish throughout the basin.

C. Strategy for Habitat Protection and Enhancement

This prioritization methodology was developed to direct efforts to particular areas and to communicate a strategy for habitat protection and enhancement. This will ensure that the location and approach of a project is appropriate. Following Roni et al. (2002) and also Frissell (1997), efforts should, in order of importance:

1) Focus on protecting areas with intact, high-quality habitats that have significant fishery value.

2) Reconnect fragmented, high-quality habitats that will help achieve fishery goals.

3) Focus on restoring hydrologic, sediment transport, and riparian condition that promote overall natural stream processes, such as improving instream water quantity, road decommissioning, and changes in land use practices.

4) Improve instream habitat through structures or channel reconstruction.

We would prefer to conduct several restoration activities such as, protecting and enhancing critical habitats, would be biologically and financially advantageous. By protecting the best fisheries, enhancing habitat that is likely to reap greater benefit, and securing the financial investment in habitat from future degradation. In addition, the site- and drainage-specific nature of restoration work must accommodate flexibility in applying priorities based on the spatial and biological context of each project. For example, a small area of habitat protected to maintain a fishery may be of less importance than a large area that has had flows improved and a fishery greatly enhanced. Therefore, in this instance, protection of a small area is less beneficial to fishery goals than restoring the hydrologic condition. Instream habitat enhancement is less important and reserved for situations where immediate habitat or function is necessary, or more natural habitat development is unlikely to occur. Passive development of habitat is encouraged. For example, protecting vegetation and letting it grow and develop into mature plants that provide shade and cover is often more effective than installing in-stream structures.

Besides the remediation of the metals in the floodplain that has been or will be conducted on the mainstems with dedicated settlement funds, the state considers the most beneficial and cost-effective enhancement projects consonant with the priorities indicated above are those that improve instream flows, fish passage, and riparian condition via passive methods such as fencing or changes in land management.

D. Strategies for Fishery Management

The primary goal for the Silver Bow Creek and Clark Fork River fisheries is to restore trout populations and associated angling opportunity. This section identifies the more specific fishery management goals for trout populations and species composition for the mainstem fisheries. These goals are derived from the program-specific restoration goals specified in the state's previous remediation and restoration plans (NRDP 2005 and 2007; DEQ and NRDP (2010) and also derived from FWP's broader management directive to provide diverse, quality angling opportunities with an emphasis on conserving remaining native fishes. Both the

program-specific goals and the broader fishery management goals, and their assumptions, play an important role in understanding prioritization strategies reflected in this document.

The Clark Fork River restoration plan (NRDP, 2007) has a goal for the Clark Fork River that restores a fishery with the following characteristics:

1. Salmonid fish density similar to healthy reference streams,
2. High species diversity (e.g., at least three species of salmonids, and representation of other families of fishes),
3. Fish age structure that indicates suitable reproduction, and
4. Species composition that does not reflect only metals tolerant species.

In addition, the Clark Fork River and its tributaries should support inter-connected migratory populations of salmonids and native fishes.

The Silver Bow Creek Watershed Restoration Plan (NRDP, 2005) has a fishery goal of a viable, self-sustaining fish community in which native species are maintained and restored where practicable. This Plan, as well as the states' integration remediation and restoration comprehensive monitoring plan for Silver Bow Creek (DEQ and NRDP, 2010) further specify indicators of a healthy fishery for evaluation of the success of remediation and restoration that generally mirror the same four characteristics as listed above for the Clark Fork River.

Mainstem Trout Populations:

Throughout the approximately 150 miles of river, we expect that the number of trout greater than seven inches should range from 500 to 1,500 per mile after the cleanup of metals contamination, barring other significant limiting factors such as very low water quantity or other pollution. Variable habitat conditions, trout recruitment from tributaries, or other factors are expected to influence trout numbers to a lesser degree. This range is based on about 1,000 to 1,400 trout per mile in comparable sections of the Little Blackfoot River, Rock Creek and Flint Creek, a range of about 500 to 1,800 trout per mile in the Bitterroot River, and about 400 to 750 trout per mile in the Blackfoot River. Looking at past estimates in the Clark Fork River below Warm Springs Ponds suggests that numbers as high as about 2,000 trout per mile are possible, but we consider this inflated, and not applicable to the entire river, because the high productivity of the Warm Springs Ponds system creates extra food for trout in this short segment of river.

The low end average number of trout per mile for Silver Bow Creek and the Clark Fork River should be about 1,000 trout per mile. The average number of trout per mile in 2009 on the

Clark Fork River was 186, which is about one-fifth of 1,000 trout per mile. This is consistent with Hillman et al. (1995) and Hillman and Chapman (1995), who found the trout in the Clark Fork River to be 5 to 6 times below that expected and no trout in Silver Bow Creek. We did not include estimates for Silver Bow Creek in our average of 186 trout per mile. Silver Bow Creek did not have enough trout to reliably calculate an estimate (only one of six sample sites had over 21 trout per mile). One-pass sampling in 2009 yielded an average of 60 trout per mile in Silver Bow Creek. This is considered a minimum number.

Fishery Management in Silver Bow Creek

In reaching the goal of maintaining and restoring native trout in Silver Bow Creek, there are challenges and opportunities. Silver Bow Creek has only become hospitable to trout recently, and it still has major factors limiting establishment of a productive mainstem fishery. Cleanup has reduced metals contamination, but very low dissolved oxygen (DO) levels and high ammonia resulting from nutrient loading (primarily from the waste water treatment plant in Butte) are now a limiting factor for portions of the creek above Browns Gulch (Naughton and Gresswell 2010). In addition, the mainstem water temperature warms to levels stressful to trout. German Gulch is likely to be a significant source of westslope cutthroat trout to the mainstem, but is threatened by mining wastes at the Beal Mine that have not been sufficiently managed to protect water quality. This provides an opportunity. Currently, brown trout are not present in Silver Bow Creek and rainbow trout and are very low in number. Brook trout are common in the tributaries of Silver Bow Creek, but are not very abundant in much of the mainstem. The reduced number of competing and hybridizing trout species provides a unique opportunity for Silver Bow Creek; that is, it is possible to re-establish a mainstem fishery that is dominated by westslope cutthroat trout.

Pursuing a cutthroat trout fishery in Silver Bow Creek is appealing from a fishery management perspective, provided water quality issues with metals and dissolved oxygen are addressed. To achieve this, however, would require a barrier, somewhere above but near the ponds, to prevent brown trout and rainbow trout from expanding into Silver Bow Creek. The feasibility of a barrier is unknown at this time. If left open, we assume, based on the habitat conditions and tolerance of brown trout, that brown trout would soon dominate the Silver Bow Creek drainage. And, while the likelihood of success of westslope cutthroat trout in Silver Bow Creek is unknown, a cutthroat trout fishery would: 1) improve and diversify angling opportunity since the vast majority of the trout in the UCFRB are brown trout; and 2) help conserve a native trout in a large drainage area. Naughton and Gresswell (2010) have shown that cutthroat from tributaries are attempting to use Silver Bow Creek. This potential fishery management direction does not preclude other options because the barrier could be removed if the attempt at a cutthroat fishery failed. Also appealing is that fish for fish, native trout, such as westslope

cutthroat trout, are much more vulnerable to angling than brown trout (Robinson and Tash 1979; Behnke 1992).

Fishery Management for the Clark Fork River

Currently, the Clark Fork River trout fishery is, for the most part, a monoculture of brown trout from Warm Springs Creek to Rock Creek, and trout densities are lower than expected due to metals contamination. Above Flint Creek, recent sampling has shown that about 99% of the trout in the Clark Fork are brown trout. Westslope cutthroat trout and rainbow trout are rare and there are no bull trout. From Flint Creek downstream to Rock Creek, only slightly more diversity is present with the inclusion of a rare bull trout, and low densities of westslope cutthroat trout and rainbow trout. Below Rock Creek to the Blackfoot River, we begin to see rainbow trout become more abundant than brown trout. Westslope cutthroat trout become common while bull trout remain rare. For native trout, we would expect that 5-10% of the fishery being bull trout and cutthroat trout is an optimistic but realistic expectation; though having a higher proportion would be encouraged if our expectation turns out to be too conservative.

High mortality of adult fish in the Clark Fork River (Mayfield and McMahon 2010), and a paucity of young trout are indicative of the effects of metals loading in the Clark Fork (Luoma et al. 2008), which still experiences acute and chronic toxicity conditions (PBSJ 2010). Brown trout are more tolerant to metals toxicity than rainbow trout (Luoma et al. 2008) and bull trout (Hansen et al. 2002), and are likely more tolerant than westslope cutthroat trout. In addition, and similar to Silver Bow Creek, there may be significant water quality degradation from nutrient loading resulting in high ammonia and low dissolved oxygen.

We expect that brown trout will continue to be the dominate trout species in the Clark Fork River after cleanup efforts are complete. This is based on their present abundance, and that habitat conditions post cleanup will likely favor them. High water temperatures and low elevation large river system habitat tend to benefit brown trout. In addition, we expect, even in the best conditions, to have some level of nutrient and metals loading stressing the fish and their habitat. Currently, even brown trout with their higher tolerance to the disturbed habitat are experiencing high mortality rates (Mayfield and McMahon 2010). Another indicator that brown trout are likely to remain dominant is that they dominate in tributaries with higher quality habitat. The Little Blackfoot River, Flint Creek and Rock Creek have colder water and no contamination, but are also dominated by brown trout. In addition, we are seeing an expansion of brown trout in the region (e.g., in the Bitterroot River and Rock Creek drainages) suggesting a broader, maybe climate influenced, trend towards more brown trout, especially with ecosystems that have been disturbed such as the UCFRB. Nevertheless, what is found in these tributaries is not independent of the conditions of the Clark Fork and we do see a more diverse

fishery moving downstream coinciding with the dilution effect of the tributaries. Therefore, we are hopeful that the Clark Fork will become more suitable for other species of trout, and native trout in particular, with the remediation of metals contamination and restoration of habitat.

Protecting and enhancing native trout populations and their habitat in the tributaries is important to allow for the improvement of native trout populations in the Clark Fork River. The general strategy is to protect viable populations, and increase abundance and distribution where possible, particularly those known to be biologically connected to the Clark Fork River. Populations should be distributed throughout the drainage and have cold, clean, complex and connected habitat, preferably with little threat of invasion or current dominance by non-native trout. Improving these habitat and biological characteristics are important protection and enhancement measures.

E. Important Considerations

This prioritization process is specific to the tributaries of the Upper Clark Fork River and Silver Bow Creek in the UCFRB, and for instream flow in Silver Bow Creek and Clark Fork River mainstems. It does not address specific fishery habitat enhancement and protection needs that occur within the floodplain corridors of the mainstem Silver Bow Creek or Upper Clark Fork River. The Silver Bow Creek and Upper Clark Fork River mainstem fisheries were the focus of the state's aquatic resource claims in its natural resource damage lawsuit and are the focus of restoration efforts addressed by other restoration planning and implementation processes.[4] This process identifies where work in tributary areas and where instream flow projects for the mainstems should be focused to best augment the integrated remediation and restoration work that has been or will be completed in the floodplain corridor of Silver Bow Creek and the Upper Clark Fork River.

Although this document identifies areas where to focus efforts, it does not constitute any predetermination of the merits of funding a particular fishery restoration project. For example, a potential project in a Priority 1 area may or may not be a worthwhile funding prospect depending on whether it appropriately and cost-effectively addresses the factor(s) that limit the fishery in that particular area and on the relationship of the project costs compared to it benefits.

The effect of prioritization should be to encourage beneficial projects in the higher priority areas (priorities 1 and 2) by providing planning and significant cost-share of NRD settlement

[4] Summary information on these other restoration efforts that are completed, planned or underway for Silver Bow Creek and the Upper Clark Fork River (Reach A) is available on the NRDP website at: http://doj.mt.gov/lands/naturalresource.

funds for development and implementation. For lower priority areas (priorities 3 and 4), project development and implementation would best involve significant cost-share from other funding sources. Obviously, with all else equal, higher priority projects will outcompete lower ones in terms of funds and timing. Project specific costs and benefits will likely create considerable variability in cost-share ratios and funding amounts.

We did not prioritize areas that do not have important fisheries but may be of other value such as a supply of cold, clean water or habitats used for migration. Furthermore, priority areas only reflect the location of the fishery, but factors outside the area may be affecting the fishery. Therefore, projects outside of identified priority areas may be worth exploring as long as there is a link to conditions that affect the fishery. For example, watershed processes, such as sediment budgets, are influenced by factors beyond the identified, local fishery, or where a migration barrier to fish using a priority area is found outside that area.

Our present understanding of UCFRB tributary and mainstem fishery conditions forms the basis of this prioritization process. This understanding is limited, due to gaps in available fishery population and habitat data and due to the infancy of the actions or results of major remediation and restoration efforts. For example, the first year results of the 3-year radio-telemetry study have shown already that some small tributaries of unknown fishery value might be important spawning streams, and that the mainstem Upper Clark Fork River's role may currently be an important spawning area but also have high adult mortality. As this work and others progress and additional information becomes available, our understanding of the condition of UCFRB fisheries and the relative importance of areas for fisheries restoration in the Basin will change. Given this, the priorities reflected herein should be reevaluated and updated at least every two years during the first five years.

F. Monitoring

We consider monitoring to be critical for successful fishery restoration. Long-term monitoring and evaluation is needed so that management strategies can be changed if fishery goals are not being achieved. Much fishery monitoring is already occurring in the basin. The state is currently implementing a long-term fishery monitoring program for Silver Bow Creek and an interim fishery monitoring program for the Upper Clark Fork River.[5] In addition, the state conducts fishery monitoring as part of the integrated remediation and restoration of the Milltown Superfund site and fishery management program for FWP. Plus, the state will continue its tributary assessment work associated with this prioritization process in the next

[5] *Interim Comprehensive Long-Term Monitoring Plan for the Clark Fork River Operable Unit, DEQ 2010.* Information on these integrated remediation and restoration monitoring efforts is available from DEQ's website at http://deq.mt.gov/rem/default.mcpx.

few years. These monitoring efforts that are underway or planned address basin-wide fishery monitoring needs in the near future. In addition to this basin-wide monitoring, it is expected that a monitoring plan that investigates select restoration projects will be developed to evaluate the cost-effectiveness and biological benefits of the NRD restoration program.

G. Public Participation

In May 2010, the state produced a draft of this document, which was subject of a 60-day public comment period in fall 2010. In April 2011, the state produced a proposed final version of this document, along with a draft response to comments document that summarized the public comments received on the draft and the changes that the state made to the draft document based on those comments. Those changes are reflected in this final document, which was approved by the Governor in December 2011, along with approval of the related final response to comment document.[6] As noted in section F, this document will be periodically revised as new information becomes available. Significant changes to this document would also be subject to public comment.

[6] *Final State of Montana's Response to Public Comment on the Draft Final Upper Clark Fork River Basin Tributary Prioritization Plan*, dated December 2011. This document is available from the NRDP's website at: http://doj.mt.gov/lands/prioritizing-aquatic-and-terrestrial-resources or from the NRDP upon request (nrdp@mt.gov or 406-444-0205).

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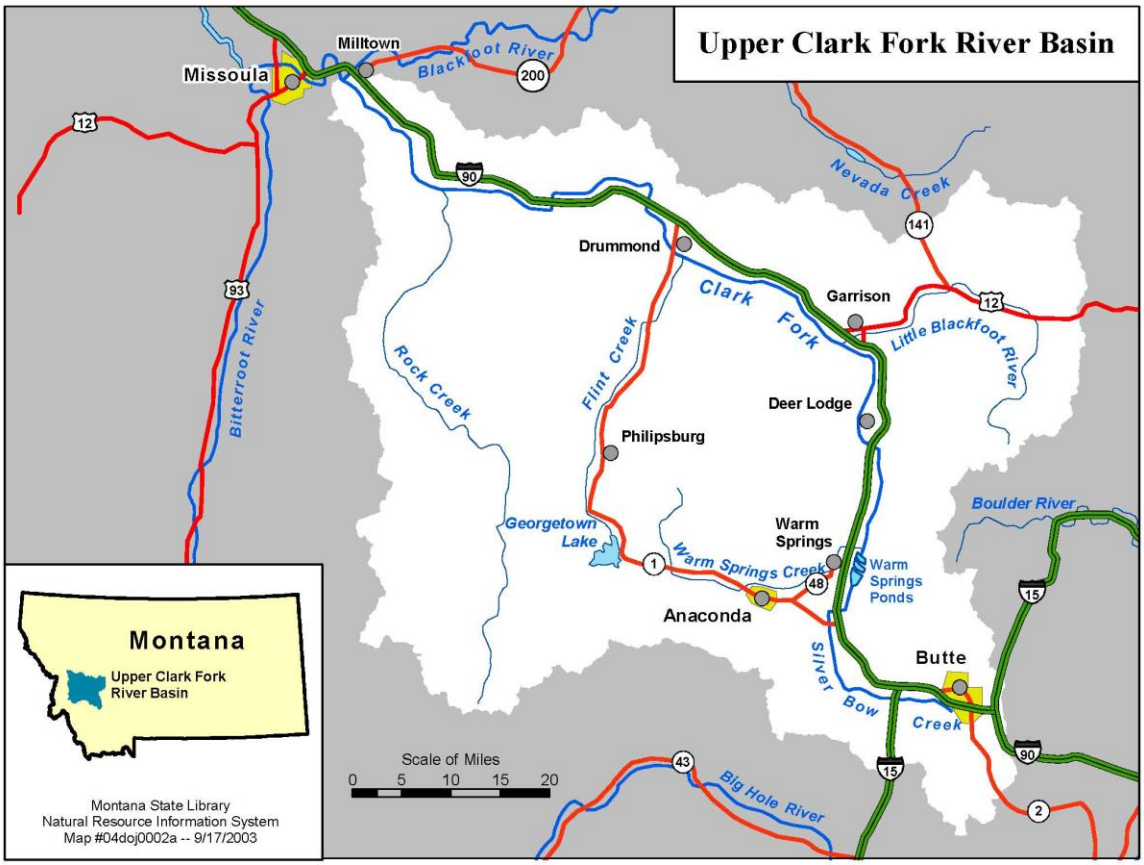
Map 1


Upper Clark Fork River Basin
Missoula
Milltown
Blackfoot River
200
12
90
93
Bitterroot River
Nevada Creek
141
Drummond
Clark Fork
Garrison
12
Little Blackfoot River
Rock Creek
Flint Creek
Deer Lodge
Philipsburg
Boulder River
Georgetown Lake
Warm Springs
Warm Springs Creek
1
48
Warm Springs Ponds
15
Anaconda
Silver Bow Creek
Butte
90
43
Big Hole River
15
2
Scale of Miles
0 5 10 15 20
Montana
Upper Clark Fork River Basin
Montana State Library
Natural Resource Information System
Map #04doj0002a -- 9/17/2003

Map 2

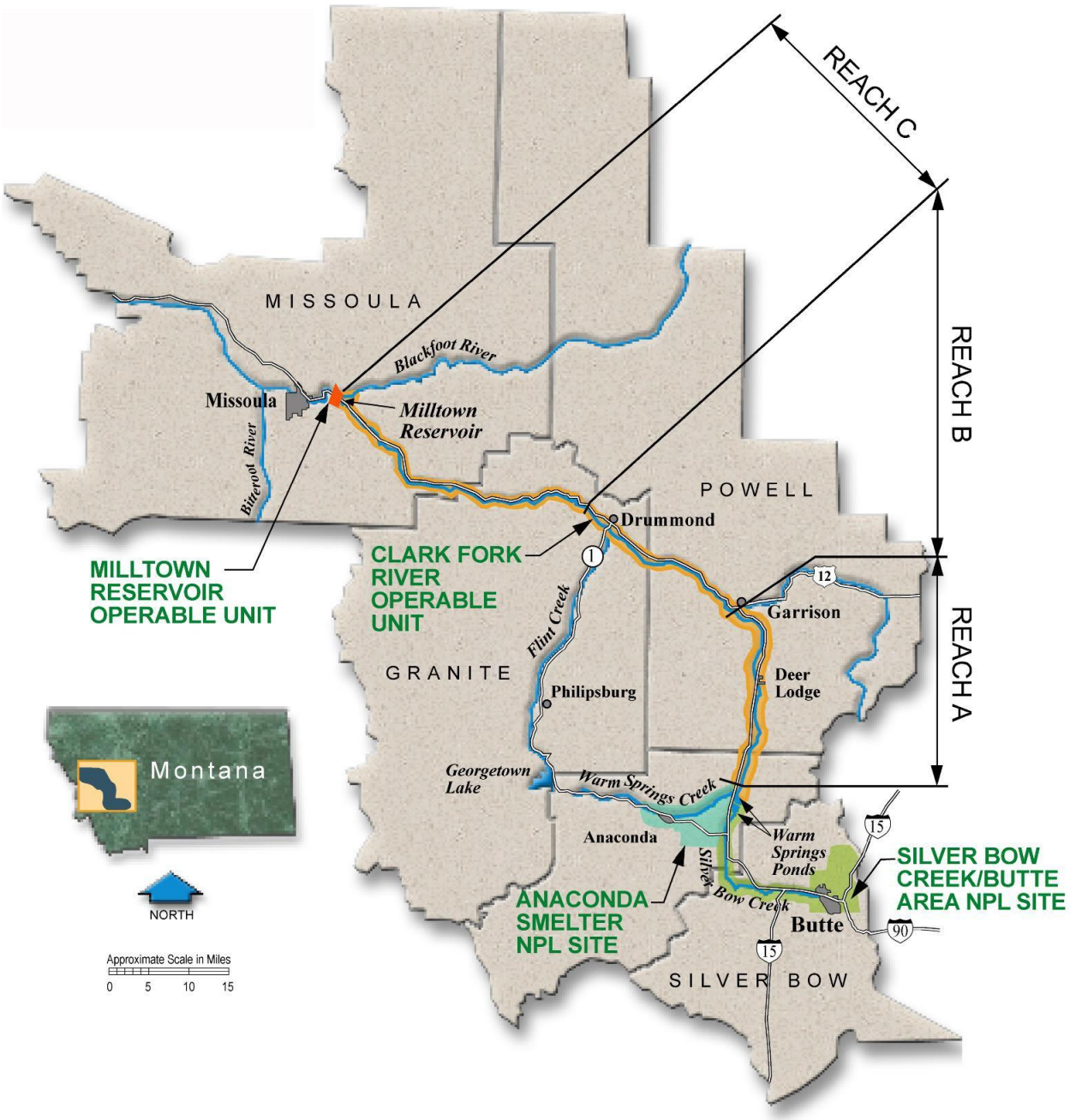

REACH C
REACH B
REACH A
MISSOULA
POWELL
GRANITE
SILVER BOW
Missoula
Blackfoot River
Milltown Reservoir
Bitterroot River
Drummond
Garrison
Flint Creek
Philipsburg
Deer Lodge
Georgetown Lake
Warm Springs Creek
Anaconda
Warm Springs Ponds
Silver Bow Creek
Butte
MILLTOWN RESERVOIR OPERABLE UNIT
CLARK FORK RIVER OPERABLE UNIT
ANACONDA SMELTER NPL SITE
SILVER BOW CREEK/BUTTE AREA NPL SITE
Montana
NORTH
Approximate Scale in Miles
0 5 10 15

Table 1. Criteria for rating the value of trout fisheries in relation to the three fishery goals for the Upper Clark Fork River and Silver Bow Creek tributaries.

	Current value				
Goal	**Very high**	**High**	**Medium**	**Low**	**Very low**
1) Restore the mainstem trout fishery by improving recruitment of fish from tributaries.	Presence of migratory adults, high density of adults and juveniles, and connectivity with the mainstem	Moderate density of native trout or high density of other trout, with connectivity intact. Typically in a smaller drainage.	Moderate to high density of fish with an unknown contribution of fish to the mainstem because of habitat impairment or distance to the mainstem.	Primarily stream resident population with limited recruitment. Most often has an upstream fish passage barrier or is a long distance from the mainstem.	No known recruitment to the mainstem or no trout.
2) Replace lost angling in the mainstem by improving trout fisheries in tributaries.	Large tributaries with excellent existing fisheries.	Moderate sized streams with a good fishery, or a significant contributor of trout to another good to excellent tributary fishery.	Tributary with moderate to high density of smaller fish, or a minor contributor to another good to excellent tributary fishery.	Very limited trout fishery due to low number of trout or stream too small for angling.	No trout fishery.
3) Maintain or improve native fish populations in the Upper Clark Fork River drainage.	Bull trout population is viable*, or very productive westslope cutthroat population with diverse life histories. Non-natives are not present or in very low number.	Bull trout present but viability is questionable, or westslope cutthroat trout population not hybridized (no introgression) and viable. Native trout dominate.	Bull trout not present or population is not viable, or westslope cutthroat trout <10% hybridized, or pure with questionable viability. Non-native trout are common.	No bull trout are present, westslope cutthroat trout are present at low densities, not viable, or are heavily hybridized (>10%).	No native trout present.

*A viable population is one that has moderate to high densities with multiple age classes indicating frequent, successful reproduction.

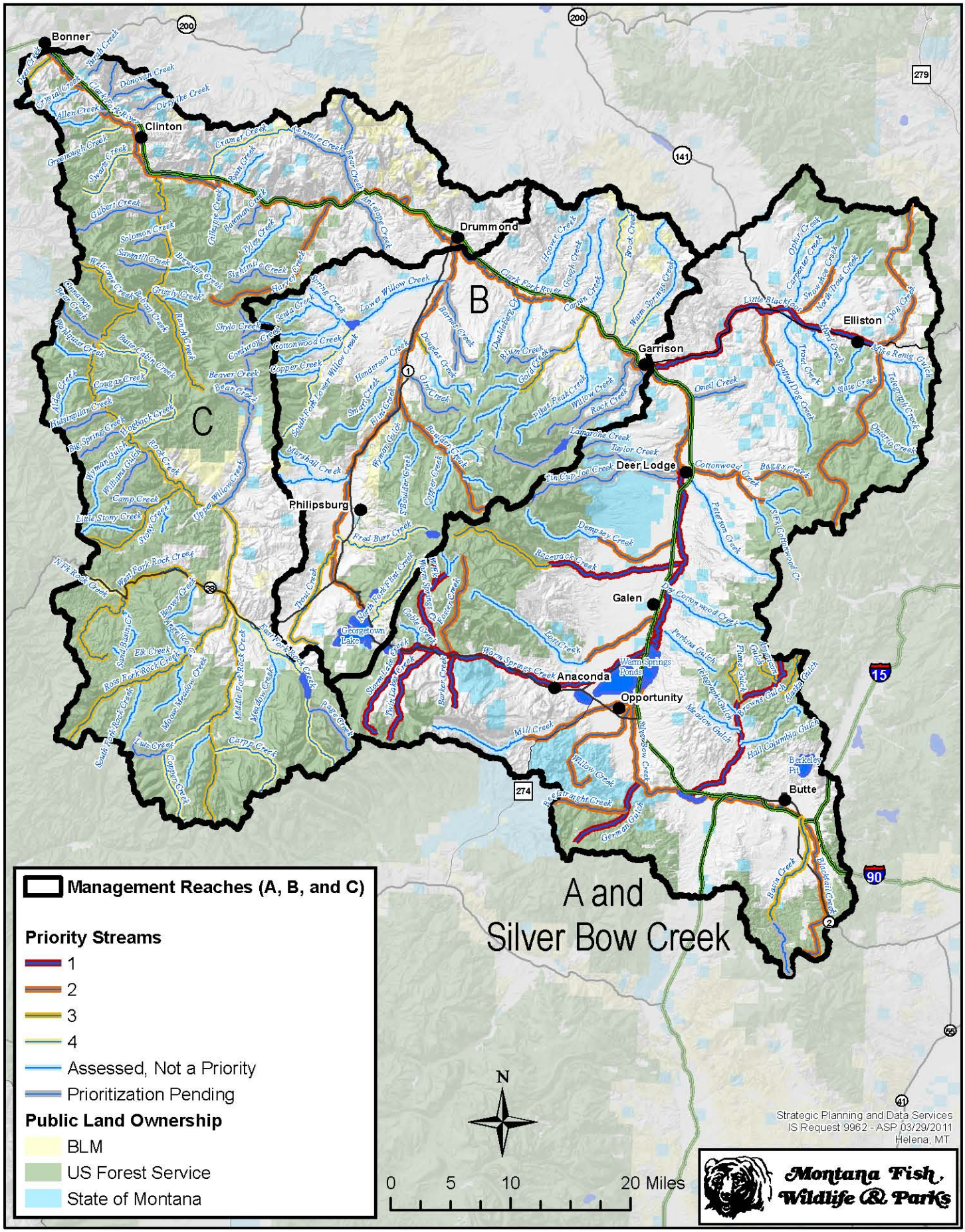
Table 2. Priority areas for protection and enhancement in the Upper Clark Fork River Basin, including Silver Bow Creek (SBC).

Priority	Criteria	Areas
1	Reach A & SBC, at least High in Goal 1 and 2, Very High in Goal 1, 2 or 3	Browns Gulch German Gulch Racetrack Cr. - Lower Little Blackfoot R. - Lower Warm Springs Cr. - Lower Warm Springs Cr. - Upper
	Reach A & SBC, Very High in Goal 3 & geographically distributed & isolated	Storm Lake Cr. Barker Cr. WF Warm Springs Cr. Twin Lakes Cr.
	Instream flow (Source water can originate from the mainstem or its tributaries)	Clark Fork R. above Deer Lodge
2	Reach A & SBC, High in Both Goal 1 and 2	Baggs Cr. Beefstraight Cr. Blacktail Cr. Cottonwood Cr. – Lower Cottonwood Cr. – Upper Dempsey Cr. – Lower Dog Cr. Foster Cr. Lost Cr. - Lower Mill Cr. - Lower Snowshoe Cr. - Lower Spotted Dog Cr. - Lower Willow Cr. Little Blackfoot R. - Upper
	Reach B, Very High in both Goal 1 and 2	Flint Cr. - Lower Flint Cr. - Upper
	Reach B, High in both Goal 1 and 2, Very High in Goal 3	Boulder Cr.
	Reach B or C, Very High in Goal 3 & geographically distributed & isolated	Harvey Cr.
	Mainstem Clark Fork River and SBC instream flow (Source water can originate from the mainstem or its tributaries)	Areas other than priority 1, including SBC
3	Reach A & SBC, High for Goals 1 or 2	Alaska Gulch American Gulch Basin Cr. – Lower Flume Gulch Racetrack – Upper
	Reach B, High for Goals 1 and 2	Douglas Cr. - Lower Trout Cr. Gold Cr. - Lower
	Reach C, High or Very High in Goals 1 or 2, Very High in Goal 3	Deer Cr. Rock Cr (Clinton) Ross Fork Rock Cr. MF Rock Cr. WF Rock Cr. Stony Cr. Welcome Cr. Ranch Cr.
4	Reach B, High or Very High in Goal 1 or 2	Brock Cr. Warm Springs Cr. (Garrison) - Lower NF Flint Cr. Fred Burr Cr.
	Reach C, High or Very High Goal 1 or 2	EF Rock Cr. (below dam) Butte Cabin Cr.

Priority	Criteria	Areas
		Hogback Cr. Cramer Cr. Swartz Cr. Greenough Cr.
	Reach A & SBC, B, or C, Very High in Goal 3	SF Lower Willow Cr. Carpp Cr. Copper Cr. (Rock Cr.) EF Rock Cr. - above dam NF Rock Cr.

Map 3

Priority Areas in the Upper Clark Fork River Basin



STATUS OF OTHER SITES

AREAS THAT ARE NOT A PRIORITY

Alder Creek
Allen Creek
Angelico Creek
Beaver Creek
Brewster Creek
Cable Creek
Carpenter Creek - Lower
Carpenter Creek - Upper
Carten Creek
Copper Creek (Boulder)
Copper Creek (S. Fk. Lower Willow)
Cottonwood Creek (Flint Cr)
Cougar Creek
Crevice Creek
Crystal Creek
Dempsey Creek - Upper
Douglas Creek - Upper
Dry Cottonwood Creek
Dunkleberg Creek
East Fork Warm Springs Creek
Elk Creek
Elliston Creek
Gillespie Creek
Gold Creek - Upper
Gough Creek
Granite Creek
Grizzly Creek
Hail Columbia Gulch
Helm Creek
Henderson Creek
Hoover Creek - Lower
Hoover Creek - Upper
Hurd Creek
Little Gold Creek
Little Stony Creek
Lost Creek - Middle
Lost Creek - Upper
Lower Willow Creek
Marshall Creek
Meadow Creek
Meadow Gulch
Meyers Creek
Middle Fork Cottonwood Creek
Middle Fork Douglas Creek
Middle Fork Warm Springs Creek

AREAS THAT ARE NOT A PRIORITY

Mike Renig Gulch
Mill Creek - Upper
Moose Gulch (Stony Cr.)
Moose Meadow Creek
North Fork Cottonwood Creek
North Fork Dry Cottonwood Creek
North Fork Gold Creek
North Fork Lower Willow Creek
North Trout Creek - Lower
North Trout Creek - Upper
Ontario Creek
Ophir Creek
Perkins Creek
Perkins Gulch
Peterson Creek
Pikes Peak Creek
Princeton Gulch
Royal Gold Creek
Ryan Creek
Sand Basin Creek
Senia Creek
Slate Creek
Smart Creek
Snowshoe Creek - Upper
South Boulder Creek
South Fork Cottonwood Creek
South Fork Douglas Creek
South Fork Gold Creek
South Fork Marshall Creek
South Fork Rock Creek
Spotted Dog Creek - Upper
Spring Creek
Telegraph Creek
Telegraph Gulch
Trout Creek (Little Blackfoot R)
Tyler Creek
Wahlquist Creek
Warm Springs Creek (Garrison) - upper
West Fork Lower Willow and Mohave Cr.
Wyman Gulch (Boulder Cr.)
Wyman Gulch (Rock Cr.)

ASSESSED, PRIORTY PENDING

AREAS THAT ARE NOT A PRIORITY

Antelope Creek
Barnes Creek
Basin Creek – Upper
Bateman Creek
Bear Creek
Bear Creek (Upper Willow Creek)
Big Spring Creek
Blum Creek
Bobcat Creek
Camp Creek
Cinnamon Bear Creek
Corduroy Creek
Dirty Ike Creek
Donovan Creek
Eightmile Creek
Gaskill Creek
Gilbert Creek
Gird Creek
Hutsinpilar Creek
Kendall Creek
Lamarche Creek
Lutz Creek
O'Neill Creek
Page Creek
Rock Creek (Garrison)
Sawmill Creek
Solomon Creek
Shylo Creek
Taylor Creek
Tenmile Creek
Tin Cup Joe Creek
Turah Creek
Upper Willow Creek
Williams Gulch
Willow Creek (Garrison)