# PART I - ADMINISTRATIVE

## Section 1. General administrative information

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| **Title of project** | |
| **Hungry Horse Fisheries Mitigation Umbrella** | |
| **BPA project number** | **20554** |
| **Contract renewal date (mm/yyyy)** | **See umbrella sub-proposals** |
| **Multiple actions? (indicate Yes or No)** | **Yes** |
| **Business name of agency, institution or organization requesting funding** | |
| **Montana Fish, Wildlife & Parks** | |
| **Business acronym (if appropriate)** | **MFWP** |
| **Proposal contact person or principal investigator:** | |
| **Name** | **Brian Marotz** |
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| **Email address** | **marotz@digisys.net** |
| **NPPC Program Measure Number(s) which this project addresses** | |
| **903 (a-b) ( NPPC 1987) 10.1B, 10.1C, 10.2A.2, 10.2B, 10.3A.1-4, 10.3A.6-13, 10.3A.17-18** | |
| **FWS/NMFS Biological Opinion Number(s) which this project addresses** | |
| **Bull Trout ESA Listing as threatened (63 FR 31647)**<br>**Westslope Cutthroat Trout - Petitioned for ESA Listing ( 63 FR 31691)**<br>**NMFS hydrosystem operations for salmon and steelhead recovery (56 FR 58619; 57 FR 14653; 62 FR 43937)** | |
| **Other planning document references** | |
| **Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam (MFWP & CSKT 1991), Hungry Horse Dam Fisheries Mitigation Implementation Plan (MFWP &CSKT 1993), Fisheries losses attributable to reservoir drawdown in excess of limits stated in the Columbia Basin Fish and Wildlife Program: Hungry Horse and Libby Dams 1987-1991 (Marotz and DosSantos 1993), Fisheries losses attributable to reservoir drawdown in excess of limits stated in the Columbia Basin Fish and Wildlife Program: Hungry Horse and Libby Dams 1991-1993 (MFWP and CSKT 1997), Fish Passage and Habitat Improvement in the Upper Flathead River Basin (Knotek et al. 1997). Montana Bull Trout Restoration Plan (Montana Bull Trout Restoration Team 1997), Montana Westslope Cutthroat Trout Restoration Plan (Montana Westslope Cutthroat Restoration Team, In preparation), Monitoring Master Plan for the Flathead Basin (Flathead Basin Commission 1985), Forest Plan: Flathead National Forest (Brannon 1985), Water Quality Data and Analyses to Aid in the Development of Revised Water Quality Targets for Flathead Lake, Montana (Stanford et al. 1997). Flathead Basin Commission Biennial Report 1995-96 (Flathead Basin** | |

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| **Commission 1997), Flathead River Drainage Bull Trout Status Report (Montana Bull Trout Scientific Group 1995a), South Fork Flathead River Drainage Bull Trout Status Report (Montana Bull Trout Scientific Group 1995b), Fish and habitat monitoring in the upper Flathead Basin (Weaver et al., In prep)** |
| **Short description** |
| **Enhance and protect native fish communities in the Flathead Basin through multi-species watershed assessments, fish passage improvements, habitat protection and enhancement, improved river flow and temperature conditions, reservoir operation strategies, off-site fishery restoration, and project-specific and watershed-level monitoring.** |
| **Target species** |
| **Native Fish: bull trout, westslope cutthroat trout, mountain whitefish, pygmy whitefish, northern pikeminnow. Non-native predator/ competitor: illegally introduced northern pike, brook trout and rainbow trout. Habitat restoration also benefits terrestrial wildlife.** |

## Section 2. Sorting and evaluation

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| **Subbasin** |
| **Upper Columbia: Flathead** |

### *Evaluation Process Sort*

| CBFWA caucus | | CBFWA eval. process | | ISRP project type | |
|---|---|---|---|---|---|
| X one or more caucus | | If your project fits either of these processes, X one or both | | X one or more categories | |
| | Anadromous fish | X | Multi-year (milestone-based evaluation) | | Watershed councils/model watersheds |
| X | Resident Fish | X | Watershed project eval. | | Information dissemination |
| | Wildlife | | | | Operation & maintenance |
| | | | | | New construction |
| | | | | X | Research & monitoring |
| | | | | X | Implementation & mgmt |
| | | | | | Wildlife habitat acquisitions |

## Section 3. Relationships to other Bonneville projects

***Umbrella / sub-proposal relationships.*** List umbrella project first.

| Project # | Project title/description |
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| 20554 | Hungry Horse Fisheries Mitigation (MFWP) |
| 9101903 | Hungry Horse Fisheries Mitigation - Habitat Restoration & Monitoring (MFWP) |
| 9401002 | Flathead River Native Species Project (MFWP) |
| 9502500 | Flathead River Instream Flow (IFIM) Project (MFWP) |
| 9101901 | Hungry Horse Mitigation - Flathead Lake and Habitat Enhancement (CSKT) |
| 9101904 | Hungry Horse Mitigation - Nonnative Fish Removal / Hatchery Production (USFWS) |

### *Other dependent or critically-related projects*

| Project # | Project title/description | Nature of relationship |
|---|---|---|
| 9608701 | Focus Watershed Coordination - Flathead Basin (CSKT) | Serves as liaison between agencies on watershed projects. Primarily cooperator in Dayton Creek restoration |
| 3874700 | Streamnet Geographic Information Services unit | Provide GIS and GPS support. Design and archive watershed maps |
| Wildlife Trust Fund | Hungry Horse Dam Wildlife Mitigation Program | Co-sponsor of Dayton Creek restoration project and other possible conservation easements |
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## Section 4. Objectives, tasks and schedules

### *Past accomplishments*

| Year | Accomplishment | Met biological objectives? |
|---|---|---|
| | | |
| 1991-present | See Umbrella Sub-proposals for Accomplishments of Individual Projects | See Umbrella Sub-proposals |
| | | |

### *Objectives and tasks*

| Obj 1,2,3 | Objective | Task a,b,c | Task |
|---|---|---|---|
| 1 | Implement NPPC-approved Hungry Horse Mitigation and Implementation Plans | a | Complete habitat restoration projects listed in the Mitigation Plans (see sub-proposal 9101903) |
| 1 | | b | Design and scope new mitigation projects following established project selection criteria (Knotek et al 1997). |
| 1 | | c | Select, scope and implement off-site restoration projects |
| 1 | | d | Conduct project-specific and watershed-level monitoring |

| Obj 1,2,3 | Objective | Task a,b,c | Task |
|---|---|---|---|
| 1 | | e | Implement CSKT project 9191901 Flathead Lake Monitoring and Habitat Enhancement (see subproposal). |
| | | f | Implement USFWS project 9191904 Nonnative Fish Removal / Hatchery Production (see subproposal). |
| 2 | Implement BPA approved mitigation for excessive drawdowns at Hungry Horse Reservoir (project 9401002), | a | Correlate seasonal relative abundance, movements and predator-prey interactions with river flow and temperature (see sub-proposal 9401002) |
| 2 | | b | Conduct biological sampling in the Flathead River to calibrate biological model for overlay on physical IFIM-based river model (see sub-proposals 9502500 and 9401002) |
| 3 | Perform modeling and technical analysis to improve dam operations | a | Link reservoir model HRMOD with new river model. Refine IRCs. |
| 3 | | b | Design improvements to selective withdrawal temperature control, flow ramping rates and seasonal operations (see sub-proposals) |

### *Objective schedules and costs*

| Obj # | Start date mm/yyyy | End date mm/yyyy | Measureable biological objective(s) | Milestone | FY2000 Cost % |
|---|---|---|---|---|---|
| 1 - 3 | | | See subproposals | | |
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| | | | | **Total** | |

**Schedule constraints**

Many projects are implemented simultaneously so that as some are delayed or modified by permitting, contracting, public opinion or new information, others continue through fruition. The Flathead IFIM project has been delayed by the BPA RFP process. Although biological sampling has proceeded on schedule, the physical framework must be completed to synthesize

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| the information and make recommendations for operational improvements. |
| **Completion date**<br>Hungry Horse Mitigation is intended to be a long-term, multi-year effort to mitigate NPPC approved fisheries losses in the mitigation plans. The Plan contains a provision to reassess fisheries losses and increase mitigation requirements if Hungry Horse Dam operation changes negatively. Negative change has already occurred due to anadromous species recovery actions. Plan should be revisited in 2025 |

## Section 5. Budget

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| **FY99 project budget (BPA obligated):** | $ **See subproposals** |

### *FY2000 budget by line item*

| Item | Note | % of total | FY2000 ($) |
|---|---|---|---|
| Personnel | See subproposals | | |
| Fringe benefits | | | |
| Supplies, materials, non-expendable property | | | |
| Operations & maintenance | | | |
| Capital acquisitions or improvements (e.g. land, buildings, major equip.) | | | |
| NEPA costs | | | |
| Construction-related support | | | |
| PIT tags | # of tags: | | |
| Travel | | | |
| Indirect costs | | | |
| Subcontractor | | | |
| Other | | | |
| **TOTAL BPA REQUESTED BUDGET** | | | |

### *Cost sharing*

| Organization | Item or service provided | % total project cost (incl. BPA) | Amount ($) |
|---|---|---|---|
| See subproposals for individual cost-shares | | | |
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| **Total project cost (including BPA portion)** | |

***Outyear costs***

| | FY2001 | FY02 | FY03 | FY04 |
|---|---|---|---|---|
| **Total budget** | See subproposals | | | |

## Section 6. References

| Watershed? | Reference |
|---|---|
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| | Carty, D., W. Fredenberg, L. Knotek, M. Deleray and B. Hansen. 1997. Hungry Horse Dam Mitigation: kokanee stocking and monitoring in Flathead Lake. Annual progress report-1996. BPA project numbers 9101901, 9101903, and 9101904. Submitted to Bonneville Power Administration. 35 pp. |
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| | Hungry Horse Implementation Group. 1994. Hungry Horse Dam Fisheries Mitigation Biennial Report, 1992-1993. Prepared for Bonneville Power Administration. 15 pp. |
| | Knotek, W.L., M. Deleray, and B. Marotz. 1997. Fish passage and habitat improvement in the upper Flathead River basin. Montana Fish, Wildlife, and Parks, Kalispell, Montana. Prepared for Bonneville Power Administration. 60 pp. |
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| | Marotz, B.L., D. Gustafson, C.L. Althen, and W. Lonon. 1996. Model development to establish integrated operational rule curves for Hungry Horse and Libby Reservoirs - Montana. Montana Department of Fish, Wildlife, and Parks. Prepared for Bonneville Power Administration. 114 pp. |
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| | Montana Department of Fish, Wildlife, and Parks and Confederated Salish and |

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## PART II - NARRATIVE

## Section 7. Abstract

The Hungry Horse Mitigation Program implements on-the-ground restoration actions, applied research and monitoring to mitigate NPPC-approved fisheries losses caused by the construction and operation of Hungry Horse Dam in northwestern Montana. Previously separate but related projects were combined in this umbrella program at the request of BPA and ISRP. We are attempting to reduce proliferating bureaucratic process and increase efficiency in the implementation of measurable, cost-effective improvements to fisheries and aquatic habitats.

## Section 8. Project description

### a. Technical and/or scientific background

In 1991, the *Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam* (Mitigation Plan) was prepared by Montana Fish, Wildlife, and Parks (MFWP) and the Confederated Salish and Kootenai Tribes (CSKT) (MFWP and CSKT 1991). This plan provided the Northwest Power Planning Council (NPPC) with documentation of fisheries and habitat losses associated with construction and operation of Hungry Horse Dam (HHD) and a flexible strategy to mitigate for these losses. It addressed six specific program measures identified in the 1987 Columbia Basin Fish and Wildlife Program and subsequent program amendments. Accepted annual fisheries losses included 250,000 juvenile bull trout (DV,*Salvelinus confluentus*) and 65,000 juvenile westslope cutthroat trout (WCT, *Oncorhynchus clarki lewisi*). The Mitigation Plan also identified 124 km of critical, low gradient spawning and rearing habitat that was inundated and lost when Hungry Horse Reservoir (HHR) filled.

The *Hungry Horse Dam Fisheries Mitigation Implementation Plan* (Implementation Plan) was subsequently developed by MFWP and CSKT, adopted by the NPPC in 1993, and funded by Bonneville Power Administration (BPA). The Implementation Plan (MFWP and CSKT 1993) describes specific, non-operational measures (activities that do not affect dam operation) to protect and enhance resident fish and aquatic habitat affected by HHD. General categories of approaches include fisheries habitat enhancement and stabilization, fish passage improvements, hatchery production and fish planting, and offsite mitigation. In 1997, Knotek et al. updated and formalized a long-term plan for identifying, prioritizing, and implementing mitigation habitat and fish passage improvement projects in the Flathead Drainage. These documents now serves as a framework for our watershed restoration efforts (project 9191903).

The Implementation Plan designates that HHD mitigation be conducted in the Flathead drainage. Onsite project areas include waters upstream of Kerr Dam that are directly connected to Flathead Lake or the upper Flathead River system and allow two-way movement of fish. Waters flowing into the South Fork Flathead River (South Fork) drainage upstream of HHD and waters that could be reconnected to the system through mitigation projects are also considered onsite. Offsite project areas are the remaining waters in the entire Flathead drainage that are separated from the contiguous lake and river system by physical barriers or by the lack of two-way movement of fish. In Knotek et al. (1997), priority areas for watershed restoration and preservation were developed based on habitat quality, fish community composition, and native fish abundance. Protection of

undisturbed habitat with strong populations of native species were given the highest priority. Degraded watersheds with introduced species and limited or non-existent native fish populations were lower priority areas when prioritizing habitat and passage projects.

The South Fork and most of the North and Middle Fork Flathead River drainages that lie outside national park and wilderness lands have been designated as priority areas in the mitigation program. Comprehensive watershed assessments for these areas are described in Read et al. (1982), Weaver et al. (1983), and May et al. (1984); more recent assessments have followed (e.g., Brannon 1985, Flathead Basin Commision 1995, Stanford et al. 1997, Weaver et al., In prep.). National Park and wilderness lands are generally not included because they remain essentially pristine and are already protected. The entire 1.1 million acre South Fork drainage above HHD is an extremely rare and important stronghold for native fish and wildlife. It is a self-sustaining, functioning ecosystem that lies entirely within the Flathead National Forest and still contains a native fish species assemblage. Reservoir tributaries and the lower third of the drainage are managed timberlands, while the upper two-thirds lie within the Bob Marshall Wilderness Complex. Portions of the North Fork and Middle Fork that are within the United States, but outside Glacier National Park and wilderness areas, support a large proportion of the remaining adfluvial DV and WCT populations in the main stem Flathead system. Although these areas have been heavily logged in the past 40 years, most of the drainages still support native fish communities. Modern logging and road building practices have been instituted on National Forest land to protect the essential environmental features for native fish.

Fish habitat losses attributed to HHD construction include blocked access to the South Fork above the dam and flooding of the once free-flowing river system. The dam created a barrier to migration that eliminated at least 40% of the DV and WCT spawning runs from Flathead Lake. About 137 km of the South Fork and 584 km of tributary stream habitat was blocked from use by Flathead Lake fish populations. Hungry Horse Reservoir filling inundated spawning and rearing habitat in 58 km of tributary stream with gradients < 6% and approximately 66 km of the South Fork. Populations of fish isolated by the dam now use HHR as a surrogate for Flathead Lake.

In the remaining Flathead drainage, DV and WCT distribution and abundance have declined. Approximately one-third of the remaining spawning areas have been degraded by excessive sediment inputs, which have decreased egg to fry survival to < 30% (Weaver and Fraley 1991; 1993). An additional one-third of the remaining spawning reaches are inhabited by introduced fish species that may compete or hybridize with genetically ‘pure’, native stocks.

Many onsite and offsite stream reaches have been blocked to fish passage by man-made or natural barriers. Fish passage problems in tributaries to HHR were documented following reconstruction of roads to accommodate higher water levels (Morton 1955). In the South Fork, approximently 20% of existing WCT and DV spawning and rearing habitat above the full pool elevation was blocked by poorly placed culverts (MFWP and CSKT 1991). Natural barriers include beaver dams and sections of stream channel that intermittently become dry due to subsurface water flow. Eliminating such barriers expands the habitat available to migratory fish. Because of concerns regarding genetics, disease, and invasion of introduced species, projects involving natural fish passage barriers are evaluated on a site-by-site basis.

Since 1992, at least 22 individual habitat and fish passage projects have been completed under this mitigation program. Projects include culvert replacements, alleviation of stream dewatering, channel restoration, riparian fencing and revegetation, biotechnical repair of point sediment sources, and lake and stream rehabilitation (eradication of introduced species). We have added >25 km of high quality spawning and rearing habitat to the system for migratory DV and WCT stocks through fish passage projects alone. Techniques for enhancing benthic insect production and re-establishing vegetation in the reservoir drawdown zone (including wetlands creation) have been investigated in pilot studies. Detailed methods, results, and evaluation of these projects are described in the Hungry Horse Dam Fisheries Mitigation 1992-93 Biennial Report (Hungry Horse Implementation Group 1994) and Knotek et al. (1997). Completed and ongoing projects are also referenced throughout later sections of this document.

Concurrent with on-the-ground projects, we have maintained extensive monitoring, watershed assessment, and research components. Monitoring includes project-specific and watershed level parameters. Specific monitoring strategies, including pre- and post-treatment sampling, have been designed for each completed and ongoing project (see sub-proposals). These are combined with watershed level, long-term, time series indices for habitat and fish populations (see project 9101903 sub-proposal, section 8f) to evaluate direct and indirect effects of our projects. We maintain this extensive monitoring program through a cooperative effort with MFWP Fisheries Management Staff and, to a lesser extent, other agencies. Monitoring appears 'heavily emphasized relative to restoration work' (ISRP FY99 review of project 9101903), but division of effort among several entities allows projects to implement their primary objectives.

Watershed assessments are an important tool for identifying projects and limiting factors. Fortunately, past studies and habitat surveys provide extensive data needed for watershed assessments. (e.g., Read et al. 1982, Weaver et al. 1983, Brannon 1985) In most assessments, we have updated and added to existing information and incorporated survey designs of land management agencies for consistency and efficiency in data collection (e.g., incorporate the USFS R1/R4 design on National Forest streams). Others have targeted areas in which no appropriate data are available (e.g., road surveys to identify point sediment sources in South Fork tributaries). All components of this program have been carried out by personnel currently associated with the project.

A second primary goal of the mitigation program involves modifications to Hungry Horse Dam operation to benefit fish. Actions that require modifications to dam operation are required to achieve roughly half of the mitigation goal (MFWP & CSKT 1991). As a result of this program, a selective withdrawal, temperature control system became operational at HHD in 1995. The device was funded by a Congressional appropriation. Selective withdrawal allows dam operators to mimic the natural thermal regime in the Flathead River. The device performed as planned for the first two complete operating periods in 1996 and 1997. The restored temperature regime could be modified if warranted by new information. During 1995 and 1996, we quantified zooplankton distribution in the reservoir forebay and entrainment through the device to serve as a basis for operational recommendations (Cavigli et al. 1998).

The 1987 FWP states that BPA shall pay for fisheries losses caused by drawdowns in excess of 85 feet at Hungry Horse Reservoir for power purposes. Fisheries losses sustained due to excessive

drawdowns were quantified by Marotz and DosSantos (1993) and MFWP and CSKT (1997). The drawdown limit remains in effect until the Integrated Rule Curves (IRCs), adopted by NPPC in 1994, are implemented. Excessive Drawdown Mitigation began in 1995 funded by BPA power supply. MFWP and CSKT directed funding toward habitat enhancement and passage improvements above HHD (sub-project 9401002) and an examination of the effects of temperature changes on aquatic macro-invertebrates and fish downstream of the dam. Biological sampling in the Flathead River has begun to correlate seasonal fish abundances, movements and predator-prey interactions with flow and water temperature. Juvenile bull trout and westslope cutthroat trout emigrate from their natal tributaries into the Flathead River and Flathead Lake where they reach maturity. During their migration to Flathead Lake the juvenile trout must pass a gauntlet of predators (northern pikeminnow, northern pike and lake trout). An understanding of the influence of flow and temperature on fish will allow managers to improve dam operations to benefit target species. A state-of-the-art radio telemetry system was installed in 1996 and 1997 on the Flathead River to monitor the movements and distribution of several target species. Environmental parameters associated with fish locations (via underwater observation) form the basis for a biological model component to be overlaid on a physical framework provided by the sub-proposal Flathead River instream flow (IFIM) project (9502500). The river project will use a modified form of IFIM using forward scanning hydroacoustics, GIS and GPS technology, and doppler profiling to model physical effects of varying flows. Synthesized information from the sub-projects will increase the resolution of the existing thermal model and complete the biological river model. The existing reservoir model HRMOD will then be used interactively with the new river model to design improved dam operations.

Integrated Rule Curves (IRCs) were developed to reduce reservoir drawdowns, improve refill probability and create normative river flows (Fraley et al. 1989, Marotz et al. 1996). Minimum flows and flow ramping rates were established to improve conditions for riverine fish and food organisms (Marotz et al. 1996). Integration of power requirements, flood control, and fisheries concerns was possible using the quantitative reservoir model HRMOD. These products and activities remain important components of the mitigation program. Previously, refining the IRCs and associated models (updates, linkages, test runs, etc) was completed under project 8346500. At the request of the ISRP and CBFWA RFM, beginning in FY2000 this component is listed as an objective under project 9101903. All operational mitigation has been designed in the context of the Columbia Basin as a whole.

### b. Rationale and significance to Regional Programs

Section 10.3A of the FWP details Hungry Horse resident fish mitigation. Measures 10.3A.11 & 10.3A.12 direct MFWP to implement habitat enhancement projects described in the Mitigation and Implementation Plans. The approved Implementation Plan, which includes fish and habitat loss statements, decision trees, and project prioritization criteria and rationale is a guiding framework for this program. In approving this plan, the NPPC and Independent Scientific Group encouraged "implementation of habitat improvement projects as a high priority." Montana's Fisheries Mitigation Guidelines also stress "natural fish reproduction and habitat whenever possible." Our goal is to maximize WCT and DV mitigation achieved through habitat enhancement and fish passage. The Flathead Basin contains some of last and best remaining

strongholds for these species.

Measures 903(a) and (b) of the 1987 FWP placed the 85 foot drawdown limit at HHD for power purposes and directed BPA to fund restoration of fish losses when the drawdown limit is exceeded. These limits remain in effect until the IRCs are implemented(measure 10.3A.3, 10.3A.7 and 10.3A.8, NPPC 1995). Measure 10.3A.4 directs MFWP to continue to refine the IRCs. The IFIM project (directed by 10.3A.18) will help refine the riverine aspects of the IRCs and provide information for consultations between MFWP, CSKT and ACOE (10.3A.9) for decision making when a conflict occurs between maintaining minimum flows (10.3A.1) and maintaining reservoir levels (10.3A.3). Measures 10.3A.6-8 direct BPA and ACOE to fund studies to evaluate HHD operations on fish and repair of fish losses when the IRCs are violated for power or flood control.

Results of many of our efforts are applicable to other programs in the Columbia River basin. Biotechnical approaches to stream habitat and riparian restoration have contributed knowledge of vegetative bank stabilization techniques. Projects also include novel or experimental approaches with wide applicability. Examples include a step-pool fish ladder completed with low-cost, natural materials and development of the IRCs which are planned for several other storage projects in the Columbia Basin. The ISG and ISAB stated that the IRCs are consistent with the normative river concept, provide a tool for assessing tradeoffs between reservoir and river requirements and recommended that they be applied to other Columbia River sub-basins. Tools for decision making are especially important now that many Columbia Basin fish species have been listed, or proposed for listing, under ESA. Changes in dam operation for recovery of lower Columbia River fish stocks have been shown to impact resident fish in the headwaters (ISAB 1997) and must be balanced to benefit all native species.

### c. Relationships to other projects

Relationship of Projects Under the Umbrella

Projects under the Hungry Horse Mitigation Umbrella are closely tied to accomplish overall goals of the program. Objectives are designed to complement or co-sponsor work of associated projects and address specific problems limiting native fish stocks in the Flathead Basin. The two ongoing mitigation projects (9401002 & 9101903) have different charges, but have worked cooperatively on several objectives in recent years. These include fish passage projects on Hungry Horse Reservoir tributaries, the Crossover Wetlands Project, and the Emery Creek Restoration Project. Only the Emery Creek project is ongoing. Project 9401002 funded initial design work (private consultant) for the project in 1998 and project 9101903 will implement stream improvements in 1999-2000. In FY1999 and FY2000, these projects will continue to concentrate on different aspects of the program as the Flathead Instream Flow Study (9502500) is initiated.

The Flathead River Native Species Project, formerly called Excessive Drawdown Mitigation - Hungry Horse Dam (project 9401002) focuses on predator/prey and other biological interactions, particularly predation of juvenile (outmigrating) cutthroat and bull trout as related to flow and temperature control in the Flathead River system. The project is also investigating how the

operation of selective withdrawal at HHD influences the distribution, abundance, and movements of introduced predators and native fish. Radio-telemetry is being used to identify seasonal location and movements of lake trout, bull trout, and westslope cutthroat trout in the drainage. Personnel will build on this database substantially as they begin addressing biological aspects of the IFIM study. Physical aspects of the IFIM project will be directly contracted by BPA (project 9502500). Coordination with biological sampling is essential to complete the river model.

The Restoration and Monitoring Mitigation Project (9101903) has a larger staff and broader range of related objectives. It focuses on restoration projects including fish passage, habitat enhancement, and small lake rehabilitation throughout the Flathead Drainage. This project also logically takes the lead on project-specific and watershed-level fish and habitat monitoring (primarily time-series) to evaluate effects of the program. Concurrent with population monitoring in the Flathead River tributaries, personnel are evaluating rainbow trout and cutthroat trout interactions (genetic introgression, overlap in timing and location of spawning, etc.) in cooperation with the University of Montana (graduate research). The mitigation project is also evaluating the response of invertebrate abundance and fish growth to operation of selective withdrawal. These objectives complement and directly mesh with the work of the Native Species project on the Flathead River (9401002).
Projects in the Flathead parallel our projects in the Kootenai watershed. IRC development progressed concurrently, using nearly identical methods and schedules. The Kootenai IFIM will be published in 1999, providing direction to the scheduled Flathead IFIM. Equipment, personnel, data and techniques are typically shared between basins.

Other Related Projects

Projects 9101901 and 9648701, administered by the Confederated Salish and Kootenai Tribes (CSKT), and Project 9101904 US Fish and Wildlife Service (USFWS) also collaborate on certain activities. Because CSKT manages the south half of Flathead Lake and tribal lands encompass the lower Flathead Drainage, we cooperate on several inter-jurisdictional projects (with project 9101903 primarily). These include all monitoring, Focus Watershed planning, and management activities involving Flathead Lake and certain tributary streams. Dayton Creek restoration is one ongoing project that we have collaboratively designed and begun to implement with CSKT and several other groups. In the preliminary watershed assessment, we completed basin-wide fish distribution and abundance surveys, installed thermographs, completed maps using MFWP's GIS support system, and made some of the initial landowner contacts. Personnel from CSKT also made landowner contacts, organized landowner meetings, and contracted a complete riparian survey for the drainage. Local conservation districts provided land ownership and water right information. The Bureau of Reclamation is currently working on a water conservation plan and the University of Montana's Flathead Lake Biological Station (Flathead Biological Station) provided water quality and nutrient loading information. We also completed a conservation easement agreement in cooperation with the Hungry Horse Wildlife Mitigation Program in this drainage.

As mentioned above, we often benefit from the Geographic Information Services Unit (Streamnet project 3874700) housed in neighboring offices. This GIS support group integrates GPS locations and provides land ownership, land use, species distribution, etc. layers that assist in

creating detailed watershed maps. These maps are essential in planning projects and have enabled us to look at the Flathead System with much greater detail.

The majority of our projects include cost-shares and collaborative efforts with other agencies (SEE SECTION 5 in subproposals). For example, we have used the BOR's Technical Assistance Program when engineering support was needed on completed Hay Creek and Crossover Wetlands Projects. Essentially, we receive engineering and other assistance without cost to our project. We hope to receive support from this program on the Sekokini Springs Project as well. We also frequently co-sponsor projects with the U.S. Forest Service when projects occur on land that they manage. Examples include the completed culvert improvements on HHR tributaries, Griffin Creek fencing project, and the Lion Lake chemical rehabilitation. In the Emery Creek restoration project, MFWP, Flathead National Forest, Trout Unlimited, the National Fish & Wildlife Foundation and Flathead Common Ground (a consensus building group made up of environmental, timber management, multiple-use, and agency representatives) are involved. The fish passage and stream restoration on Paola Creek is also a cooperative project among the Forest Service, National Fish & Wildlife Foundation (funds pending), and Project 9101903. Other groups that have routinely cooperated on projects include local Conservation Districts, Montana Conservation Corps, Montana Department of Natural Resources and Conservation, and the Flathead Biological Station. The Flathead Biological Station has collected useful water quality, invertebrate, and other ecological data throughout the Flathead Lake and River system. We have incorporated these data, the expertise of station personnel, and contracted studies in past and current projects. In 1999, we will begin a graduate study examining interactions of rainbow trout and cutthroat trout. Hybridization and competition between these species is a major threat to native cutthroat trout stocks.

Habitat and fish passage projects typically require Montana Stream Preservation Act (124) permits, Temporary Water Quality (turbidity) Exclusion (3A) Permits, Army Corps of Engineers 404 Permits, and Environmental Assessments. Cooperative relationships with land management agencies often expedites permitting and project implementation.

**d. Project history** (for ongoing projects)

See Sub-proposals for a detailed history of each project

**e. Proposal objectives**

See Umbrella Project Sub-proposals.

**f. Methods**

See Umbrella Project Sub-proposals.

**g. Facilities and equipment**

All offices, equipment, and facilities are located at the MFWP regional headquarters in Kalispell,

Montana for MFWP projects. This 5 acre complex, built in 1990 , houses ~55 MFWP employees in addition to our project personnel. Facilities include several boat sheds, a machine shop, wet laboratory, field prep room, storage buildings for project equipment, and office space for all staff. Other specialized equipment includes a 22 ft boat with inboard motor, 14 ft boat with outboard motor, Bobcat skid-steer loader with backhoe (shared with Libby Dam Mitigation Project), backpack and bank electrofishing units, GPS units, laser level and surveying equipment, microscopes, cameras, and project vehicles from the MFWP motor pool. Fisheries management and Parks Divisions have other specialized equipment available when occasionally needed for projects: boom trucks, dump trucks, trailers, additional boats and vehicles, etc.

We have sufficient computer and communications equipment. In addition, our office houses the Geographic Information Services Unit (GIS support) for the state. This group frequently assists our project in GIS, GPS, and mapping applications. They also manage the Montana River Information System (MRIS).

See subproposals for information on CSKT and USFWS facilities.

**h. Budget**

We desire to combine the associated projects under the MFWP Umbrella for greater budgeting efficiency and potential cost saving. The watershed restoration and monetoring project has been operating at a nearly stable budget of $470 to $500 thousand per year. Slight increases in out-year budgets reflect predicted inflation. The river project initially increased in cost and subsequently reduced and stabilized at approximately $250 thousand per year, reflecting mainly a reduction in contracted services. The IFIM project has been approved for the first two of the three year effort and is not expected to require additional funding after FY2000 provided that previous funding remains obligated to this effort. The modeling and technical analysis project was incorporated as objectives in the Hungry Horse and Libby Mitigation projects as recommended by the ISAB and the CBFWA RFM at $10 thousand per year in each. Comparatively low overhead costs and employee salaries combined with frequent cost-share agreements has allowed MFWP to execute our contractual agreements cost-effectively. Reduced bureaucratic process would further this goal.

See umbrella sub-proposals for justification of individual project budgets.

## Section 9. Key personnel

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### Education

Master of Science – Fisheries Management
Louisiana State University - Baton Rouge, Louisiana.
Estuarine Biology

15 Credits: Gulf Coast Research Institute
Ocean Springs, Mississippi.
Marine Science

Bachelor of Science – Biology (Aquatic Sciences)
University of Wisconsin - Stevens Point, Wisconsin.
Freshwater Biology

16 Credits: S.E.A. Semester at Sea, Boston University
Woods Hole, Massachusetts
Marine Biology

### Professional experience

*1991*-Present Fisheries Program Officer, Montana Fish, Wildlife & Parks
Kalispell, Montana
Duties: Supervise Special Projects Office, Hydropower Mitigation and Focus Watershed Programs. Oversees all BPA sponsored projects in the Upper Columbia Basin of Montana. Directly supervise principal investigators and represents MFWP at CBFWA resident fish managers and Members meetings.

*1989 – 1991* Fisheries Biologist, Montana Fish, Wildlife & Parks
Kalispell, Montana
Duties: Hungry Horse Reservoir Research, Develop Hungry Horse Mitigation Program, Computer Modeling Flathead and Kootenai Drainages, Develop Integrated Rule Curves (IRCs) for Montana Reservoirs.

*1985 – 1989* Fisheries Biologist, Montana Fish, Wildlife & Parks
Libby, Montana
Duties: Libby Reservoir Research, Kootenai Instream Flow Project, Computer Modeling Flathead and Kootenai Drainages, Develop Integrated Rule Curves (IRCs) for Montana Reservoirs.

*1984 – 1985* Research Associate, Louisiana State University - Baton Rouge, Louisiana
Duties: Estuarine Research to control salt water encroachment to Estuarine Marsh on the Sabine National Wildlife Refuge. Developed Operating Plan for Water Control Structures to Allow Migration of Catadromous Fish and Crustaceans

### Publications

Pertinent Publications Listed in this Document

### Awards

1994 Governor's Award for Excellence in Performance as an Employee of the State of Montana

1994 Director's Award for Excellence as an Employee of Montana Fish, Wildlife & Parks

1989 Certified Fisheries Scientist
American Fisheries Society

**See umbrella sub-proposals for personnel associated with each subproject.**

## Section 10. Information/technology transfer

Project results will be published in reports to BPA and, where applicable, peer reviewed journals. Quarterly progress reports are sent to all interested agency and citizen groups. Results of the program are frequently presented at professional meetings within and outside MFWP, and in the public arena through invited presentations, newsletters, and news coverage. MFWP currently supports a state-wide rivers database with information on streams, fisheries, species distribution, etc. This database is administered from within our office and is accessible through MFWP's Internet web site.

In addition to annual and quarterly reports, project summaries including background, problem statement, restoration options, actions, and monitoring are completed for each fish passage and habitat project. For instance, summaries for 17 completed and ongoing projects are presented in Knotek et al. (1997). Summary reports are generally prepared for each major habitat restoration project; e.g., Hay Creek Restoration, Crossover Wetlands. We are currently preparing a document which presents results of watershed level monitoring activities since 1988 (Weaver et al., In prep.). We will also prepare a report in 2000 that summarizes monitoring and research activities associated with selective withdrawal.

**See umbrella sub-proposals for information transfer associated with CSKT and USFWS subprojects.**

## Congratulations!