Public Review

TIGER MUSKIE INTRODUCTION

Draft Environmental Assessment

MEPA/NEPA/HB495 GENERIC CHECKLIST

PART I. PROPOSED ACTION DESCRIPTION

1. Type of Proposed State Action: New Fish Species Introduction

2. Agency Authority for the Proposed Action: MCA87-5-701-721 (Importation, Introduction, and Transplantation of Wildlife); ARM 12.7.60 (General Policy for Fish Planting); ARM 12.7.701 (Authorization for Department and Commercial Fish Planting).

3. Name of Project: Tiger Muskie Introduction, Horseshoe Lake, Lincoln County, Montana

4. Name, Address, and Phone Number of Project Sponsor (if other than the agency):

   Montana Fish, Wildlife & Parks
   Region 1 Fisheries
   490 N. Meridian Road
   Kalispell, MT 59901

5. If Applicable:

   Estimated Construction/Commencement Date – August 2006
   Estimated Completion Date – Summer 2006
   Current Status of Project Design (% complete)

6. Location Affected by Proposed Action (county, range and township):

   Horseshoe Lake is in the Kootenai River drainage and is part of the Thompson Chain of Lakes. The lake is a closed-basin lake with a maximum depth of 133 feet, average depth of 45 feet, and a surface area of 137.6 acres. Horseshoe Lake is located in Lincoln County, Montana, at T27N, R28W, Section 23.

7. Project Size: Estimate the number of acres that would be directly affected that are currently:

   (a) Developed:
   residential ..... __ acres
   industrial ..... __ acres

   (b) Open Space/Woodlands/
   Recreation ..... __ acres

   (c) Wetlands/Riparian
   Areas ..... __ acres

   (d) Floodplain ..... __ acres

   (e) Productive:
   irrigated cropland..... __ acres
   dry cropland..... __ acres
   forestry ..... __ acres
   rangeland..... __ acres
   other .....137.6 acres

8. Map/site plan: attach an original 8½" x 11" or larger section of the most recent USGS 7.5' series topographic map showing the location and boundaries of the area that would be affected by the proposed action. A different map scale may be substituted if more appropriate or if required by agency rule. If available, a site plan should also be attached. (See Fig. 1)

9. Narrative Summary of the Proposed Action or Project Including the Benefits and Purpose of the Proposed Action:

A. Proposal

FWP proposes to introduce tiger muskellunge (F1 hybrids of female muskellunge Esox masquinongy X male northern pike E. lucius) into Horseshoe Lake, Lincoln County, Montana. Tiger muskies would be obtained from the Miles City State Fish Hatchery, which obtains eggs from Wisconsin.

In 1997, the FWP Commission adopted the Thompson Chain of Lakes Fisheries Management Plan (Hensler and Vashro, 1997). The preferred alternative selected for Horseshoe Lake through public comment was to prepare an environmental assessment for introduction of tiger muskie as a biological control for overabundant nongame fish to aid in establishing a recreational fishery and to provide a unique fishing opportunity for western Montana.

An environmental assessment for tiger muskie was prepared and released September 5, 2000, for two weeks of public comment. Due to requests by the public, the comment period was extended an additional two weeks to September 30. A total of 167 comments were received consisting of letters, e-mails, phone calls, form letters, and petitions. There were 65 comments opposed to the introduction and 102 in favor. This is a very high level of interest.

Comments tended to be very polarized for or against the proposal. Comments in favor of the proposal focused on creating additional fishing opportunity, creating more warm/coolwater fishing opportunity, and support for a unique tiger muskie fishery. Comments against the proposal focused on conflicts with existing recreation (boating, water skiing, swimming), effects on water quality, illegal fish transplants, tiger muskie sterility, and tiger muskie predation on loons, other waterfowl, and amphibians.

Due to the level of concern over potential impacts, the proposal was delayed while additional research was conducted. Presented below are responses to issues.

Q. Where did this proposal come from?

A. Northwest Montana has experienced rapid population growth, in many cases outstripping fishing opportunity. A fisheries management plan was completed for the Thompson Chain of Lakes in 1997 for the purpose of maximizing fishing potential and opportunity. The plan was developed by FWP and a Citizen Advisory Committee, with public meetings and a questionnaire. Over 200 responses were received, and the preferred alternative for Horseshoe

Lake was to prepare an EA for the introduction of tiger muskie. If tiger muskie reduced nongame fish densities, rainbow trout could then be planted. A Montana Warmwater Fisheries Management Plan was also prepared in 1997 that supported preparation of an EA for tiger muskies in Horseshoe Lake. Due to continued requests by anglers, an initial EA was completed in 2000.

Q. What fish species are in Horseshoe Lake now?

A. Horseshoe Lake is currently dominated by nongame fish species (Hensler, 1993, 2004). Fish species in order of abundance are northern pikeminnow (formerly called squawfish) Ptychocheilus oregonensis, largescale sucker (Catastomus macrocheilus, and redside shiner Richardsonius balteatus. Rainbow trout (Onchorynchus mykiss) have been stocked occasionally, with the last plant in 1990. Growth and survival for stocked trout have been poor due to competition with and predation by the nongame fish. There was some angling response to the 1990 plant, but the rainbows are assumed to be gone and current angling use is low to nonexistent.

Table 1. Gill-net data from Horseshoe Lake.

Date	Fish Species	Number	Catch Per Net	Size Range
6/18/73	NSQ	36	12.0	7.4 – 19.0”
	CSS	37	12.0	6.0 – 18.0”
	Wf	1	0.3	---
6/9/82	NSQ	47	23.5	6.9 – 14.0”
	CSS	14	7.0	6.3 –18.0”
	Rb	1	0.5	9.6”
9/16/92	NSQ	69	9.9	---
	CSS	19	2.7	---
	Rb	4	0.6	14.3 – 15.0”
5/21/04	NSQ	110	36.7	6 – 20”
	CSS	31	10.3	5 – 18”

NSQ = Northern pikeminnow (squawfish) Rb = Rainbow trout
CSS = Largescale sucker Wf = Whitefish

Q. What is a tiger muskie?

A. A tiger muskie is a hybrid between a female muskellunge and a male northern pike. As such, tiger muskies exhibit traits that are often a blend of both parents, for example they are more catchable than muskies, but not as catchable as northern pike. In this environmental assessment the term “esocids” will be applied generically to muskies/tiger muskies/northern pike, which all belong to the family Esocidae. Esocids are known to be top predators; however, tiger muskies aren’t so named because they are more predaceous than either parent, but rather because this hybrid has vertical bars on its sides, which resemble a tiger’s stripes rather than the horizontal

markings of either parent. Anglers familiar with northern pike will find tiger muskies to be fairly similar in behavior.

Q. Are tiger muskies truly sterile?

A. Tiger muskies are functionally sterile as a species. Satterfield (1993) conducted an extensive literature review and interviewed fisheries professionals in 9 states with extensive esocid populations. There were no reports of fertile male tiger muskies, even when males were injected with hormones. Black and Williamson (1947) reported ovulation in female tiger muskies injected with carp pituitary hormones. The females produced very small quantities of eggs that were fertilized by both male muskellunge and northern pike. All the tiger x muskellunge fry died. The tiger x northern pike offspring did survive. Rod Ramsell (personal communication), Minnesota, DNR, has looked at about 30,000 esocids. Every male tiger muskie he has looked at has been sterile. He feels he sees ovulation and visible eggs in about one out of ten female tigers. He has observed what appeared to be 5 backcrosses with northern pike based on physical appearance. He did not test those fish genetically.

The issue of tiger muskie x northern pike backcrosses is somewhat moot. Northern pike form reproducing populations and tiger muskie management would be abandoned in the presence of northerns. Backcrosses appear to be very rare in nature due to low viability of eggs and fry, and differences in the timing and location of spawning between esocids. Hybrid backcrosses would trend back toward northern pike traits if repeated crosses occurred.

Use of a sterile fish such as tiger muskies would allow densities to be closely managed. If unexpected impacts occur, stocking would be halted, and the fish would fade away.

Q. What is the goal of the tiger muskie introduction proposal?

A. There are 3 possible goals: 1) reduce nongame fish abundance through predation, 2) establish a unique trophy fishery for tiger muskies, and 3) establish recreational fishing for trout and/or kokanee salmon.

Tiger muskie have been shown to be very effective in controlling soft-rayed fish of all sizes and tiger muskie select soft-rayed fish over spiny-rayed fish (Gillen, et al., 1981; Carline et al., 1986; Wahl and Stein 1988, 1993; and Beyerle and Williams, 1968). Soft-rayed, nongame fish are common in Horseshoe Lake. Pumpkinseeds are spiny-rayed, but are in low abundance in Horseshoe Lake.

Tiger muskie can provide significant control on suckers and return the competitive advantage to trout. In Horseshoe Reservoir, Colorado, white suckers made up 95 percent of the fishery, and catch per net was 57 suckers and 1.8 rainbows. After 10 years of tiger muskie introductions, catch per net had changed to 2.8 suckers and 13.5 rainbows (Melby, 1996). Other Colorado waters showed declines in suckers and carp of 33-85 percent

(Satterfield and Emblad, 1995) with tiger muskies. In H.C. Kuhr Reservoir, Montana, tiger muskie virtually eliminated a white sucker population (Gilge, personal communication). In Lebo Lake, Montana, trap net catches of white suckers declined from 395 suckers per net to 5.3 suckers per net after six years of tiger muskie plants (MFWP, 1998), and gill net catches of suckers less than 12" dropped from as high as 82 per gill net before tiger muskies to 1.2 suckers per gill net in 1990 (Fraser et al., 1992). A thriving trout fishery was established after suckers were reduced. Tiger muskies were used to reduce northern pikeminnow populations in Mayfield Reservoir, Washington, to benefit stocked rainbow trout and anadromous salmon and steelhead (Tipping, 2000). Tiger muskies in Merwin Reservoir, Washington, reduced northern pikeminnows by 80%, and a kokanee fishery flourished (Tipping, personal communication).

Tiger muskies may also provide a unique trophy fishery. Growth rates are excellent. Tiger muskies planted in Lower Glaston Reservoir, Montana, at 1.2 inches in 1989 averaged 15.5 inches in 1990 and 25.2 inches in 1991. In 1992 the tigers averaged 28.8 inches and 5.56 pounds (Fraser et al., 1992).

Similar growth rates have been reported for Missouri (Goddard, 1978) and Illinois (Newman et al., 1986) with fish approaching 30 inches in three years. In most states, including Montana, tiger muskies are managed with conservative bag limits and a minimum size length of 40 inches to maximize biological control, maintain limited supplies of stocked fish, and to ensure some fish reach trophy size. The state record tiger muskie for Montana is 27.0 pounds caught in Lebo Lake in 1994. State record fish exceed 38 pounds in Idaho (Horner, personal communication), 31 pounds in Washington, and 40 pounds in Colorado (Quinn, 1995).

Some lakes can be managed for both salmonids (trout, salmon) and esocids (Rutz, 2000). Shallow, weedy lakes tend to produce high numbers of esocids and maximize overlap with salmonids so that salmonids may be severely reduced. However, esocids tend to be cover-oriented and generally use water less than 30 feet deep. Lakes such as Horseshoe Lake, with a deep central basin (maximum 133 feet deep) and relatively little shallow shoreline habitat, would hold relatively few esocids with little habitat overlap except during coolwater periods of spring and fall when salmonids move nearshore. A good local example is the Thompson Chain of Lakes. Upper Thompson Lake is shallow and weedy and has high numbers of northern pike (and bass) and very few trout or salmon. Middle and Lower Thompson Lakes are much deeper with relatively fewer northern pike and good numbers of trout and salmon. Swan Lake has had northern pike for about 30 years. A popular pike fishery largely occurs in several specific shallow areas. Salmonids have been found in pike stomachs in the spring; however, the deep main lake basin supports good numbers of kokanee and bull trout with lesser numbers of rainbow and cutthroat trout. Fish managers reported trout and salmon fishing either improved or showed no impacts after tiger muskie introductions in Horseshoe Reservoir, Colorado (Melby, 1996), Lebo Lake, Montana

(MFWP, 1998), Freeman and Hauser Lakes in Idaho (Horner, personal communication) and Washington lakes (Gallacher, 1995), including Mayfield Reservoir (Tipping, 2000) and Merwin Reservoir (Tipping, personal communication). Rainbows and kokanee have been able to survive in Echo Lake near Bigfork, Montana, despite very high numbers of largemouth bass and pike. Kokanee appear to survive better, probably due to their tendency to suspend in the middle of the lake.

Q. How many tiger muskies would be planted?

A. Tiger muskies by nature are solitary, territorial fish. Minnesota introduces tiger muskies at the rate of 1 fall fingerling/acre per year for 5 years and then drops to 1 tiger muskie/surface acre every 2-3 years (Ramsell, personal communication). Quinn (1995) reports most states stock 1-to-10 fall fingerlings per surface acre, and 3-5 fish per acre usually provide a fishery. Horseshoe Lake is 137 acres so plants could range from 140-to-1,400 fingerlings. Satterfield (1993) estimated adult populations would average about 1 large fish per 5 surface acres. This would amount to about 30 adult tiger muskies and possibly less since not all the lake is suitable habitat.

Q. Would the presence of tiger muskies affect loons and bald eagles on Horseshoe Lake?

A. Rod Ramsell, Minnesota DNR (personal communication, 2000), notes that loons and esocids co-evolved in the central U.S. and Canada, and loons may have evolved some protective traits. Loons are the Minnesota state bird, with more than 11,000 loons present. Loons are commonly found in lakes with esocids. Ramsell has examined over 2,000 esocid stomachs and never found a loon chick.

Kenow et al. (2002) used subcutaneous transmitters and observation to track loon chick mortality in Wisconsin lakes. Six of twenty (11 tagged, 9 untagged) chicks died. Of the 4 known mortalities, one was killed by an adult loon, one died from intestinal parasites, and two died from aquatic predators, either snapping turtles or large fish. Kenow (personal communication) felt that the predators were likely fish due to the movement of the tag post-mortality, but he did not know what species of fish were present in the lakes.

In an interesting twist, an adult loon on Swan Lake was observed eating an estimated 16-18” northern pike (Rost, 2005).

Loon nesting data for western Montana assembled by Bissell (personal communication, 2000) showed that, for 70 lakes with successful nesting since 1986, 19 (27 percent) contained northern pike. Of 15 lakes that no longer supported successful loon nesting, only 1 contained northern pike.

A different grouping of loon lakes (Bissell, 2002) for the Blackfoot, Clearwater, Swan, Flathead, and Kootenai drainages and the Thompson Chain of Lakes showed 49 lakes with consistent use by nesting loons. Seventeen (35%) of those lakes contain northern pike. Nine more lakes

have not had evidence of breeding in recent years, and 6 of those lakes contain northern pike.

Lack of nesting success may not be due to direct pike predation, but due to angling for pike. Pike anglers may move slowly along shorelines to fish and displace adult loons from their nests, exposing eggs and chicks to weather and predators. Posting of known loon nesting sites and direct contacts with recreationists by loon rangers have significantly decreased human disturbance and increased loon nesting success on lakes with active pairs in northwest Montana. Horseshoe Lake has a history of loon nesting through the late 1980s, but not in recent years. It appears a high amount of human disturbance, including motorboating, jet skiing, and water-skiing, may have displaced the loons. In addition, much of the suitable nesting habitat is occupied by campgrounds or on islands near campgrounds or the public boat ramp. Recent drought conditions have also reduced shoreline suitability as lowered lake levels have exposed several feet of unvegetated shoreline.

Historically, TCL had at least 6 known loon-nesting territories on at least 5 lakes including Horseshoe Lake. Recent observations indicate nesting habitat may now be limited in comparison to historical levels primarily due to increased recreational use in the area.

Since 1999, 2-3 loon territories have remained active at TCL. Based on monitoring data over the last 2 years, a fourth pair has tried to set up a nesting territory on nearly all of the major lakes. Observations indicate that the loons are unable to readily find additional secure nesting on the existing major lakes in the TCL. Additional management may be needed at TCL to increase nesting pairs through the use of platforms, floating signs, and education to quiet/improve habitat for nesting areas. It is possible that this proposed fish introduction could increase recreational uses on Horseshoe Lake, particularly during the spring nesting season, and further reduce its potential for loon nesting.

Horseshoe Lake had a successful nesting pair of bald eagles documented since 1990, and chicks were produced in 8 of 14 years (K. Dubois, personal communication). Introduction of tiger muskies into Horseshoe Lake could change the fish community and potential disturbance levels. To reduce the impacts of an improved boat ramp in 1999, FWP instituted a ¼-mile voluntary closure area around the existing bald eagle nest on Horseshoe Lake from March 15 to July 1 each year (Fig. 1). This closure goes out into the lake and is also marked on shore and on all FWP's maps for the area. The current education and voluntary restriction seems to have been effective. Most use appears to be camping, recreational boating, canoeing, swimming, and other water activities. If a sport fishery is introduced, fishing pressure will increase over current levels, particularly during the early spring when bald eagles begin to establish their territories and are most vulnerable to disturbance. Increased education about the eagles would be needed to ensure the public knew about the voluntary closure and to insure eagles were not disturbed.

Q. Would the introduction of tiger muskies into Horseshoe Lake affect any amphibians, including rare or sensitive species?

A. A survey of the Thompson Chain of Lakes by Hendricks (2000) revealed the presence of long-toed salamanders (Ambystoma macrodactylum), boreal (western) toad (Bufo boreas), Pacific tree frogs (Hyla regilla), and Columbia spotted frog (Rana luterventris). Of these, the boreal toad is listed as a sensitive species. In 2000, long-toed salamanders and Columbia spotted frogs were found in waters close to Horseshoe Lake. Boreal toads were found only in 2 waters to the west of Horseshoe Lake; however, boreal toads were found in upper Thompson Lake, which contains northern pike as well as largemouth bass, so the presence of predatory fish does not preclude their presence.

A 2002 survey by Skybak (personal communication) of Horseshoe Lake itself found Columbia spotted frog adults and egg masses. Horseshoe Lake currently contains large numbers of adult northern pikeminnows. This large native minnow is known to be predaceous on a wide range of fauna and may have as much impact as the proposed tiger muskies.

Q. Won't tiger muskies eat everything in sight and then starve to death?

A. Esocids are often described as "voracious" predators. However, food habits studies reveal some surprising results. Tipping (2000) prepared an annotated bibliography of food habit studies for 54,204 esocids. The bibliography included 49,908 northern pike stomachs, 2,860 muskellunge stomachs, and 1,436 tiger muskie stomachs. Roughly one-third to one-half of esocid stomachs are usually empty. Most stomachs with food items included fish and aquatic invertebrates (insects, crayfish, etc.). Other food items from more than 54,000 esocid stomachs were:

1 Redwing blackbird (baby)
1 muskrat (baby)
22 mice/voles
6 mammals (mice/voles?)
44 frogs, several mudpuppies, tadpoles
1 snake
45 waterfowl – mostly coots, one wood duck

- 45% of ducks were less than 1 week old.
- 10 days for complete digestion.
- One study in a waterfowl refuge observed 5,535 duckling minutes (1 duckling for 1 minute) with no attacks; one duckling was tethered in a pool with pike, with no attacks.

Esocids do not differ significantly from many other top predatory fish. Fish exhibit a high conversion rate, that is, pounds of weight gained versus pounds of prey eaten. Esocids show a conversion rate of 1:2 to 1:3 (Wahl and Stein, 1988; Weithman and Anderson, 1977), that is, they gain a pound of weight for every 2-to-3 pounds of prey eaten. A ten-pound pike will have eaten about 30 pounds of prey to get to that weight. That is actually better than other predators such as bass or trout, which have conversion ratios of

1:3 to 1:6. A ten-pound bass or brown trout will have eaten 30-to-60 pounds of prey to get to that weight. This difference is explained when you consider the sedentary, ambush nature of esocids as compared to the roving nature of most other predators, which burns up more energy. Esocids do attain given weights more quickly and consistently than other predators so their consumption rate is higher than other fish, but they do not necessarily eat more total prey than other predatory fish.

Q. Will tiger muskies attack swimmers and anglers?

A. Esocid bites have occurred, but are highly sensationalized and exaggerated. Some fish, such as sharks and piranhas, can bite chunks of flesh out of victims. However, esocid teeth are such that they can only swallow their prey whole. Esocids are likely to choke on anything too large to swallow, so evolution has trained them to not attack large prey.

A search of news stories over the last two decades in the North United States and Canada found 4 accounts of people being bitten while dunking their feet in the water, 1 person bitten while washing hands from a dock, and two swimmers bitten on the hand or foot while splashing in shallow or murky water. Each of these bites appeared to be mistaken identity, and the fish released its hold immediately, leaving punctures and lacerations. These 7 esocid bites are repeated frequently in the media, giving the impression of a large number of attacks. Ramsell (2000), of Minnesota DNR, reported he has handled about 30,000 esocids and never been bitten. In response to a specific report of a lake closed to swimming in Iowa, Mike Mason and Tim Yancy, Iowa DNR, were contacted (personal communication, 2000). Neither was aware of any esocid attacks in Iowa or of any lakes posted closed to swimming due to esocids. Northern pike have now been commonly found in western Montana for 20-30 years in many lakes commonly used for swimming, boating, and fishing. There have been no reported pike bites.

Q. Horseshoe Lake has historically been used for boating and water-skiing. Won't planting tiger muskies interfere with that?

A. It is recognized that speedboating and water-skiing have been the predominant recreation on Horseshoe Lake for many years. There is no intent to change that. There is a potential for conflict between anchored or slow-moving fishing boats, speedboats, and water-skiers. However, esocids are cover-oriented, so most fishing is done near shore. Realistically, when speedboating and water-skiing are occurring, most anglers choose to head for quieter waters. Anglers and water-skiers have generally been able to sort out their uses in the rest of the TCL and western Montana. Jim Darling, Region 5 fisheries manager in Billings, reports that Deadman's Basin has a popular tiger muskie fishery that coexists with heavy recreational boating (Darling, personal communication).

More conflicts would potentially occur if tiger muskies reduced nongame fish to the point where trout or salmon could be introduced. Trout and salmon would tend to use the deeper part of the lake where anglers would be more in

conflict with speedboaters and water-skiers. This could easily be mitigated by closing the lake to trout and salmon fishing during the summer when conflicts are most likely to occur, leaving salmonid fishing to fall, winter, and spring, when there is little or no recreational boating.

Anglers point out that the Thompson Chain of Lakes is managed under the Fishing Access Program, and that $67,000 of fishing license funds have been used to build the access and ramp at Horseshoe Lake. Anglers feel some fishing opportunity should be provided since fishing license dollars are being used for development, operation, and maintenance at Horseshoe Lake.

Q. What if tiger muskies are illegally transplanted to other waters?

A. Illegal fish transplants are a very real fish management concern in Montana, particularly in northwest Montana where there have been 267 illegal plants into 146 waters (Vashro, 2005).

There would be relatively few tiger muskies in Horseshoe Lake, and they are only moderately catchable. It would be difficult to move a significant number of tiger muskies to any other water. Tiger muskies could survive in most lakes, but do not prefer flowing waters (streams). There is a low potential for tiger muskies to backcross if moved into a lake with northern pike, but such a lake would already show all the impacts associated with esocids. Tiger muskies can live 10 or more years, but they are catchable enough that they are likely to be caught before that. Any tiger muskie regulations would be specific to Horseshoe Lake, so tigers caught elsewhere would not be protected by a standard tiger muskie regulation.

10. Listing of any Other Local, State, or Federal Agency that has Overlapping or Additional Jurisdiction:

(a) Permits:

Agency Name	Permit	Date Filed/#

None

(b) Funding:

Agency Name	Funding Amount

Montana Fish, Wildlife & Parks

(c) Other Overlapping or Additional Jurisdictional Responsibilities: None

11. List of Agencies Consulted During Preparation of the EA: Idaho Fish and Game, Minnesota DNR, and Iowa DNR.

PART II. ENVIRONMENTAL REVIEW

A. Evaluation of the Impacts of the Proposed Action Including Secondary and Cumulative Impacts on the Physical and Human Environment:

PHYSICAL ENVIRONMENT

1. LAND RESOURCES **Will the proposed action result in:**	IMPACTS				Can Impacts Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Other:		X				

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Land Resources (Attach additional pages of narrative if needed):

PHYSICAL ENVIRONMENT (continued)

2. AIR **Will the proposed action result in:**	IMPACTS				Can Impacts Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Emission of air pollutants or deterioration of ambient air quality?		X				
b. Creation of objectionable odors?		X				
c. Alteration of air movement, moisture or temperature patterns, or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Other:		X				

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Air Resources (Attach additional pages of narrative if needed):

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

PHYSICAL ENVIRONMENT (continued)

3. WATER **Will the proposed action result in:**	IMPACTS				Can Impacts Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen, turbidity or pathogens?		X				
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				
d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				
g. Changes in the quantity of groundwater?		X				
h. Increase in the risk of contamination of surface or groundwater?		X				
i. Violation of the Montana Non Degradation Statute?		X				
j. Effects on any existing water right or reservation?		X				
k. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				
l. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
m. Other:		X				

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Water Resources (Attach additional pages of narrative if needed):

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

PHYSICAL ENVIRONMENT (continued)

4. VEGETATION **Will the proposed action result in:**	IMPACT				Can Impacts Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?		X				
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered plant species?		X				
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Other:		X				

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Vegetation Resources (Attach additional pages of narrative if needed):

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

PHYSICAL ENVIRONMENT (continued)

5. FISH/WILDLIFE Will the proposed action result in:	IMPACT				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X			5b
c. Changes in the diversity or abundance of non-game species?			X			5c
d. Introduction of new species into an area?			X			5d
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X		Yes	5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?			X		Yes	5g
h. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Fish/Wildlife Resources (Attach additional pages of narrative if needed):

5b, c, d: This project will create a new population of tiger muskies with the intent of reducing existing populations of suckers and northern pikeminnow through predation. If this project is successful, trout or salmon might be introduced at a later date.

5 f, g: A survey for the Thompson Chain of Lakes found no unique, rare, threatened, or endangered amphibian or reptile species that would be adversely affected (Hendricks, 2000). Bald eagles currently nest on Horseshoe Lake and may be disturbed if voluntary closure is not followed. Common loons have also nested at Horseshoe Lake in the past. They use the lake for foraging and attempted to establish a territory in 2003. Other boating activities and loss of shoreline habitat combine to make nesting difficult unless a nesting platform and floating signs are used to quiet an area for common loon nesting. Establishment of tiger muskies could reduce the potential return of common loons by adding more recreational use, particularly in the spring and near shore, without increased education.

HUMAN ENVIRONMENT

6. NOISE/ELECTRICAL EFFECTS Will the proposed action result in:	IMPACT				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Increases in existing noise levels?		X				
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				
e. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Noise/Electrical Effects (Attach additional pages of narrative if needed):

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

HUMAN ENVIRONMENT (continued)

7. LAND USE Will the proposed action result in:	IMPACT				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?		X				
d. Adverse effects on or relocation of residences?		X				
e. Other:		X				

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Land Resources (Attach additional pages of narrative if needed):

HUMAN ENVIRONMENT (continued)

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?		X				
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?		X				
c. Creation of any human health hazard or potential hazard?		X				
d. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Risk/Health Hazards (Attach additional pages of narrative if needed):

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

HUMAN ENVIRONMENT (continued)

9. COMMUNITY IMPACT Will the proposed action result in:	IMPACT*				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				
f. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Community Impact (Attach additional pages of narrative if needed):

HUMAN ENVIRONMENT (continued)

10. PUBLIC SERVICES/TAXES/UTILITIES Will the proposed action result in:	IMPACT*				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____			X			10a
b. Have an effect upon the local or state tax base and revenues?		X				
c. Result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Result in increased used of any energy source?		X				
e. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Public Services/Taxes/Utilities (Attach additional pages of narrative if needed):

10a: A successful tiger muskie introduction will increase fishing use at Horseshoe Lake and increase the need for education and enforcement to ensure security for bald eagles and possibly for nesting common loons. Lake use may have to be managed seasonally if recreation use impacts sensitive wildlife.

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

HUMAN ENVIRONMENT (continued)

11. AESTHETICS/RECREATION Will the proposed action result in:	IMPACT*				Can Impact Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)		X				
d. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Aesthetics/Recreation (Attach additional pages of narrative if needed):

HUMAN ENVIRONMENT (continued)

12. CULTURAL/HISTORICAL RESOURCES **Will the proposed action result in:**	IMPACT				Can Impacts Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Destruction or alteration of any site, structure or object of prehistoric, historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural or historic values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				
d. Other:						

Narrative Description and Evaluation of the Cumulative and Secondary Effects on Cultural/Historical Resources (Attach additional pages of narrative if needed):

*Include an attachment with a narrative explanation describing the scope and level of impact. If the impact is unknown, explain why the unknown impact has not or cannot be evaluated.

SIGNIFICANCE CRITERIA

13. SUMMARY EVALUATION OF SIGNIFICANCE **Will the proposed action, considered as a whole:**	IMPACT				Can Impacts Be Mitigated*	Comment Index
	Unknown*	None	Minor*	Potentially Significant*		
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?			X		X	13e
f. Other:						

Narrative Description and Evaluation of the Summary Evaluation of Significance (Attach additional pages of narrative if needed):

13e: Some people will oppose this proposal on the general principle of not introducing new species. There is controversy over the potential impacts of pike and muskies on the fish community, especially trout and other species such as loons and amphibians. There will also be debate about potential conflicts between boat anglers and recreational boaters and water-skiers.

PART II. ENVIRONMENTAL REVIEW (Continued)

Description and analysis of reasonable alternatives (including the no action alternative) to the proposed action, whenever alternatives are reasonably available and prudent to consider, and a discussion of how the alternatives would be implemented:

Management options include:

1. No action: Allow Horseshoe Lake to persist in its current state with a fishery dominated by nongame fish. No stocking of gamefish would occur. Recreational fishing use would remain low.

2. Chemically rehabilitate Horseshoe Lake with rotenone and restock with desired fish species. This option would have the highest cost (estimated over $100,000), but would provide the highest angling use and harvest.

3. Introduce tiger muskie as a biological control for nongame fish. This would be a relatively low-cost option that has been effective in reducing nongame fish in other locations. This would also provide a unique fishery and might provide conditions to establish trout or salmon populations. Tiger muskies would be stocked for 3 years in late summer with 140 fingerlings and then 140 fingerlings every 2 years after that. If nongame fish show reductions in densities after 3 years, rainbow trout and kokanee would be stocked. A standard tiger muskie limit of 1 fish per day, 40" minimum length, would be established for Horseshoe Lake. Summer angling closures for rainbows and kokanee would be explored if stocked.

4. Use another predaceous gamefish, such as northern pike or kamloops rainbow, to control nongame fish. Northern pike would control suckers and pikeminnows, but would form a self-reproducing population that could not be controlled, unlike the sterile tiger muskie. Kamloops rainbow were stocked in 1990, but showed poor growth and survival. Kamloops in nearby waters have not been successful in controlling nongame fish.

The preferred alternative is Alternative 3, the introduction of tiger muskie into Horseshoe Lake.

PART III. NARRATIVE EVALUATION AND COMMENT

Evaluation and listing of mitigation, stipulation, or other control measures enforceable by the agency or another government agency:

Angling harvest will be controlled through fishing regulations. If adverse impacts develop, tiger muskie abundance will be controlled through halting of stocking, liberalization of angling limits, and direct capture. Impacts with other recreationists could be controlled with seasonal fishing closures. If loons and eagles are impacted directly or indirectly, seasonal restrictions on recreation will be combined with education and enforcement. If there are conflicts between boaters and anglers, conflict can be managed with angling or boating restrictions.

PART IV. EA CONCLUSION SECTION

A. Based on the significance criteria evaluated in this EA, is an EIS required? YES / NO If an EIS is not required, explain why the EA is the appropriate level of analysis for this proposed action:

> An EA is the appropriate level of analysis. Horseshoe Lake is a closed-basin lake, and the impacts of a tiger muskie introduction will be confined to the nongame fish population in the lake. Any recreational use conflicts that arise can be mitigated with angling restrictions. Potential impacts on loons and bald eagles can be managed through seasonal restrictions with education and enforcement.

B. Describe the level of public involvement for this project, if any, and given the complexity and the

seriousness of the environmental issues associated with the proposed action, is the level of public involvement appropriate under the circumstances?

The EA will be direct mailed to interested individuals and organizations within the local area and the state. The EA will be posted on the FWP web site and a news release issued to the media. A public meeting will be held at the Fisher River Fire Hall at Happy's Inn on August 29, 2005. There will be an open house from 6:00-7:00 p.m. and public comment from 7:00-9:00 p.m.

C. Duration of comment period, if any: Thirty days, from Tuesday, August 9, through Thursday, September 8, 2005.

D. Name, title, address, and phone number of the person(s) responsible for preparing the EA:

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jvashro@mt.gov

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University of Montana
Missoula, MT

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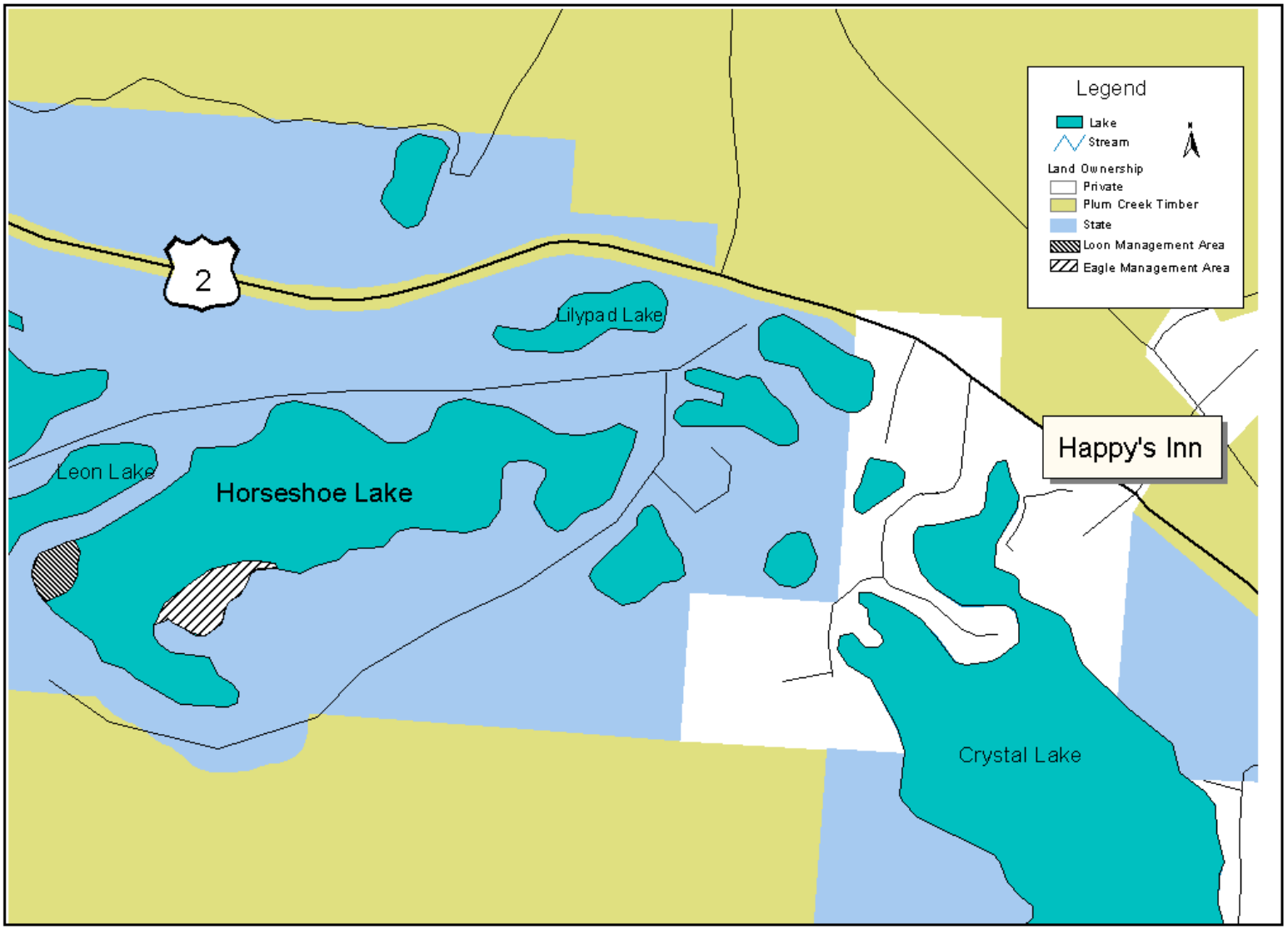
Legend
Lake
Stream
Land Ownership
Private
Plum Creek Timber
State
Loon Management Area
Eagle Management Area
2
Lilypad Lake
Leon Lake
Horseshoe Lake
Happy's Inn
Crystal Lake

Figure 1