

I. Project Title: Translocation of northern pike from the Yampa River upstream of Craig, Colorado.

II. Principal Investigators:

Sam Finney, Fishery Biologist
Bruce Haines, Fishery Biologist (retired)
U. S. Fish and Wildlife Service
1380 South 2350 West
Vernal, UT 84078
(435) 789-0351/ fax (435) 789-4805
sam_finney@fws.gov
bruce_haines@fws.gov

III. Project Summary

Northern pike is a large esocid native in many North American drainages that has been widely stocked outside of its natural drainages for sportfishing purposes. Stocking of northern pike outside of its natural range can have many negative effects on native and endangered fishes, existing sport fisheries or commercial fisheries such as salmon in the Pacific Northwest (Conover 1986). Specifically, negative effects may include, but are not limited to, altering entire communities through top down effects (Colby et al. 1987), colonization of pike beyond the introduction point (McMahon and Bennett 1996), and competition with, and predation on, existing fish in the system (Findlay et al. 2000).

Northern pike have become well established in the Yampa River, Colorado, probably from escapement from Elkhead Reservoir (a reservoir on Elkhead Creek, a tributary to the Yampa River) where it was originally stocked to provide public fishing opportunities. Northern pike have established a large, reproducing population in the Yampa River (Nesler 1995; J. Hawkins, Colorado State University, personal communication). The large population provides a source for continual movement of pike into the lower Yampa River and further downstream into the Green River where it coexists with three endangered fishes — Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), and humpback chub (*Gila cypha*). Northern pike provide a significant predatory risk to these species, especially juveniles and small adults of Colorado pikeminnow and razorback sucker and a significant predatory risk to other native species in the basin (Martinez 1995; Nesler 1995). Northern pike were identified as presenting a significant risk to endangered fishes by a majority of upper basin researchers in surveys conducted during the late 1980's (Hawkins and Nesler 1991).

The Upper Colorado River Endangered Fish Recovery Program (Recovery Program) has conducted experimental projects to control nonnative fishes in the upper basin to assist in recovery of the endangered fishes. To date, the Recovery Program has initiated nonnative reduction efforts for channel catfish, smallmouth bass, and northern pike in the Yampa and Green rivers, channel catfish and smallmouth bass in the Colorado River and small cyprinids in the Colorado and Green River drainages. In some cases, such as the Yampa River, northern pike have been removed from the main channel and stocked into off-channel impoundments to provide fishing opportunity for local anglers.

Temporarily reducing the pike population through mechanical means appears to be an option (Lentsch et al. 1996, Tyus and Saunders 2000), although complete eradication is unlikely. A small, non-reproducing population of northern pike in the Gunnison River was reduced with relatively little effort applied at a time when pike were vulnerable (McAda 1997). Initial sampling efforts in the Yampa River suggested that substantial numbers of northern pike can be captured during spring runoff when they enter shallow floodplain habitats for spawning (Nesler 1995; U.S. Fish and Wildlife Service, unpublished data).

This is the sixth year of sampling in the study area and the 2006 study design is nearly identical to the previous two years. Objectives of this study are to reduce numbers of adult northern pike in the study reach, determine population size and structure of northern pike in the study reach and the subsequent changes in the population size and structure after removal and translocation, determine if removing fish in identified concentration areas is effective, maintain public support for the Recovery Program by providing off-channel angling opportunities, and monitor the native fish community and smallmouth bass population in the study area.

IV. Study Schedule: To be continued as needed

V. Relationship to RIPRAP:

GREEN RIVER ACTION PLAN: YAMPA AND LITTLE SNAKE RIVERS

III.A.1.b Control northern pike.

III.A.1.b(1) Remove and translocate northern pike and other sportfishes from Yampa River

VI. Accomplishments of FY 2006 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Study Site

The Yampa River is a relatively free flowing river that originates on the west slope of the Rocky Mountains and flows 320 km to its confluence with the Green River. The portion of the Yampa that makes up the study site flows through low gradient agricultural lands. Seasonal flows in the study reach fluctuate between 100 and 13,000 cubic feet per second (USGS, provisional data), however in recent years flows have typically been lower.

All sampling for this study was conducted in a 38-mile reach of the Yampa River between Hayden and Craig, CO (hereafter referred to as the removal reach, Figure 1). The study reach was broken into two-mile segments. The two-mile segments allow for identification of juvenile and adult fish concentration and areas of high catchability.

Materials and Methods

Northern pike were collected using two pulsed DC electrofishing boats, each sampling opposite sides of the river except where large backwaters were present. In this case, both boats sampled the backwater on the same side of the river. Seven electrofishing passes were made between April 18th and June 16th 2006 and coincided with spring runoff. Sampling was done between 2500 and 6500 cfs on the ascending and descending limbs of the hydrograph. Due to rapidly increasing flows, the 1st pass was a removal pass for fear of not being able to sample again before peak flows, in which case population estimate assumptions would not be met. During the second electrofishing pass all pike were marked and released. During the next five electrofishing passes pike were removed from the Yampa River, placed in fish hauling boats and trucks, and stocked into ponds accessible to the fishing public. During pass six, concentration areas identified in passes 1-5 were targeted.

Pike were marked using a T-bar tag with an individual tag number and were finclipped as a means of a double tag to meet population estimation assumptions. All northern pike were scanned for the presence of passive integrated transponder (PIT) tags that are being used by other investigators studying pike in the basin. Lengths of northern pike, discharge, and capture reach were recorded.

All smallmouth bass captured were tagged with T-bar tags, and total length (TL) and capture reach recorded before being released. Bluegill and crappie were counted and euthanized. The number of mountain whitefish encountered was recorded during pass 7.

Population estimates for northern pike were calculated using standard Petersen mark-recapture techniques and we believe all assumptions were met. The population estimates derived from electrofishing data took into account the removal of pike during pass 1 by adding the number of pike removed during this pass to the final point estimate. This was deemed accurate, as the number of pike removed during pass one is an absolute. Estimates were only derived for adult fish (>300mm, CDOW unpublished data) due to low capture probabilities of juvenile fish.

Results and Discussion

Northern Pike Population Estimation and Removal Effectiveness

Six hundred and ninety five northern pike of all sizes were captured during the study of which 587 were removed. The adult population estimate of northern pike in 2006 was 717 (338-839 95% C.I.). Of the estimated 717 adult northern pike in the 38-mile stretch of upper Yampa River from Hayden to Craig, 452 were removed. Despite a 63.0% decrease, we were unable to show a significant decrease in catch rates over the study time (d.f. = 6, F = 3.04, P = 0.141, Figure 2). In addition to the 452 adult fish removed, 135 juvenile pike were removed in 2006. Final disposition of all northern pike captured is outlined in Table 1.

Catch rates in 2006 varied by reach (Figure 3). Catch rates declined in all but four reaches between 2005 and 2006, dramatically declining in the reach with the large backwater.

Length frequency of pike captured in 2006 (Figure 4) shows a bimodal distribution. There seems to be a large number of fish in the age-1 and age-2 size classes (CDOW, unpublished data). There was no significant decline in mean length over time (d.f. = 6, F= 2.13, p = 0.20), and mean length of northern pike removed was not different between passes (d.f. = 6, F= 0.63, P = 0.71, Figure 5) as it was in 2004 and 2005.

Targeting Concentration Areas

A comparison of CPUE between pass 5, pass 6, (concentration sampling), and pass 7 reveals that we were mildly effective at targeting concentration areas on pass 6 (Figure 2). Catch per unit of effort (pike/hr) went from 2.49 on pass 5 to 4.93 on the concentration pass, and then decreased to 3.33 on pass 7, the next reach-wide pass. Despite this “spike” in the CPUE during the concentration pass, logistics make carrying out the concentration passes difficult. When sampling in this manner, shuttling trucks and trailers becomes more time consuming, time that could have been used removing fish. Never the less, we feel that targeting areas of high adult pike concentration and nursery areas is still warranted.

A large backwater at river mile 150 is an old river channel that has been cut off and contains a large amount of aquatic vegetation. Localized areas of pike concentration coincide with low velocity vegetated areas (Desantos 1991). The backwater has contained large amounts of northern pike in previous studies (See Finney and Haines 2005, and Pfeifer et al. 2003). The 2005 data indicate that river mile 150 is a very unique and dynamic portion of the study area that requires extra effort in future sampling years.

In 2006, this backwater was sampled 8 times and 190 pike were captured. Sixty-four of the fish captured were juvenile fish (33.7%) compared to (60.8%) in 2005. We feel as though the backwater is an important nursery area, and it should be targeted in the future. We also feel that we are being successful in limiting reproduction by targeting this area (see Figure 3).

Northern Pike Foreign Tags

In 2006, we captured 62 pike that had been tagged by previous investigators. Fifteen fish came from the Yampa River from upstream, 7 came from Catamount reservoir, 31 were from previous years sampling in the reach, 2 came from Chris Hill's study, 6 came from the reach below, and one is of unknown origin (blue tag). We detected no known escapement from Loudy Simpson, State Wildlife Area ponds, or Elkhead Reservoir in 2006.

Smallmouth Bass

Sixty-eight individual smallmouth bass were captured during the study period. Movement estimates and population estimation were not possible due to low numbers of recaptures. Smallmouth bass were distributed near the bottom of the study area (Figure 6) and were captured in greater numbers during later passes (Figure 7).

Bluegill and Crappie

In 2006, 12 bluegill and 20 crappie were captured. This is a dramatic decline from the numbers seen in 2005 and likely reflects the lower escapement rate from Elkhead Reservoir or their lower survival indicative of a life history being poorly suited to a riverine environment.

Native Fish

Whitefish counted on pass 7 of the 2006 sampling effort totaled 55 and were distributed in the upper portions of the study area (Figure 7). No pure strain native suckers, chubs, or Colorado pikeminnow were observed in 2006.

VII. Recommendations:

1. Continue with one tagging pass and 6 removal passes. Consider one or two of these removal passes in upstream nursery areas.
2. Continue monitoring the native fish community
3. Expand into upstream areas thought to be nursery areas for pike

VIII. Acknowledgements

The authors wish to thank numerous seasonal personnel for their help in the field. Tim Modde provided valuable comments on an earlier version of this document.

IX. Project Status:

The project is considered on track but minor revisions are suggested. It is subject to review prior to continuation.

X. FY 06 Budget Status:

- A. Funds provided: \$143,585
- B. Funds expended: \$143,585
- C. Difference: -0-
- D. Percent of the FY 2006 work completed: 100
- E. Recovery Program funds spent for publication charges: -0-

XI. Status of Data Submission:

Data will be sent to the database manager in 2006. Data are currently being entered in Microsoft™ Excel spreadsheets.

XII. Signed: Sam Finney November 8, 2006
Principal Investigator Date

Table 1. Final disposition of northern pike captured or removed from the Yampa River study site, 2006. LS= Loudy Simpson, SWA=State Wildlife Area, CDOW/CSU= given to Colorado Division of Wildlife or Colorado State University for cleithra or otolith elemental analysis.

	Released	LS	SWA	CDOW/CSU	Died	Escaped	Total
Pass 1		161					161
Pass 2	107				1		108
Pass 3		109		17	12		138
Pass 4		89		22			111
Pass 5		64			1		65
Pass 6			40		7		47
Pass 7		15	40	6	3	1	65
Total	107	438	80	45	24	1	695

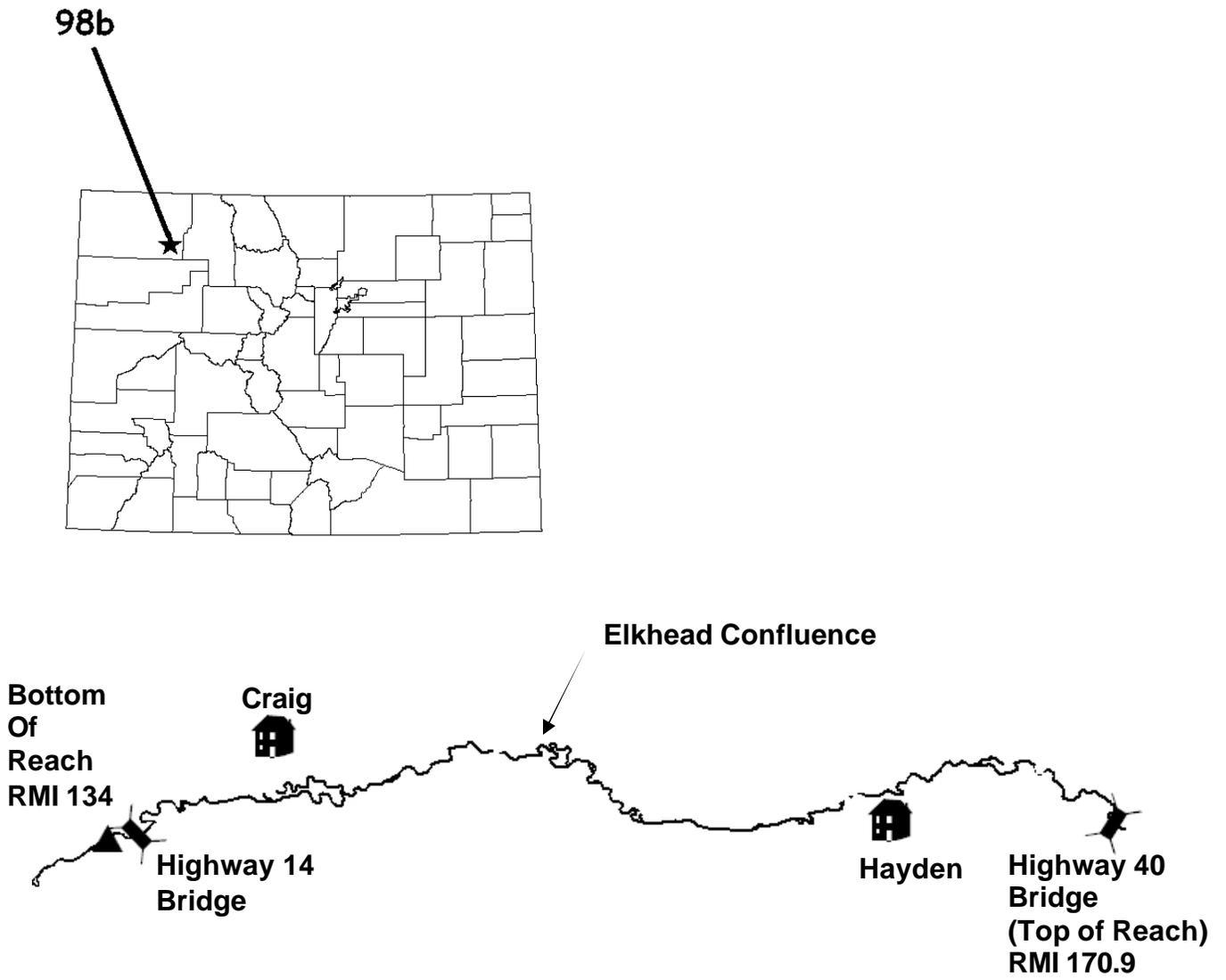


Figure 1.? Upper Yampa River Study Site. RMI= River Mile.

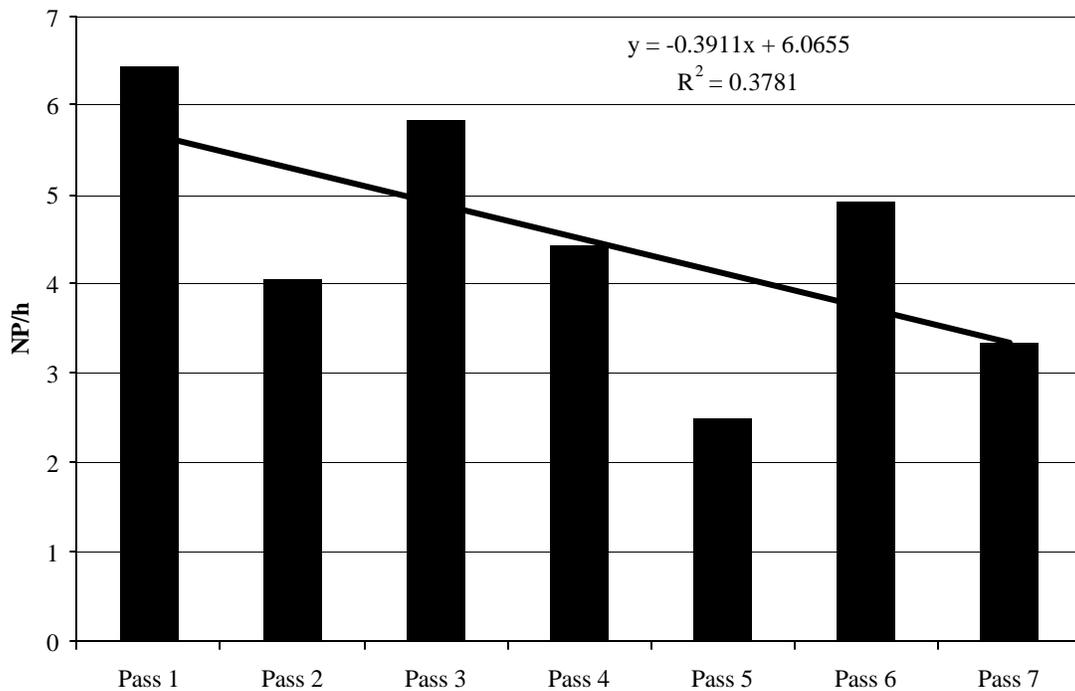


Figure 2. Catch per unit of effort of northern pike by pass, 2006.

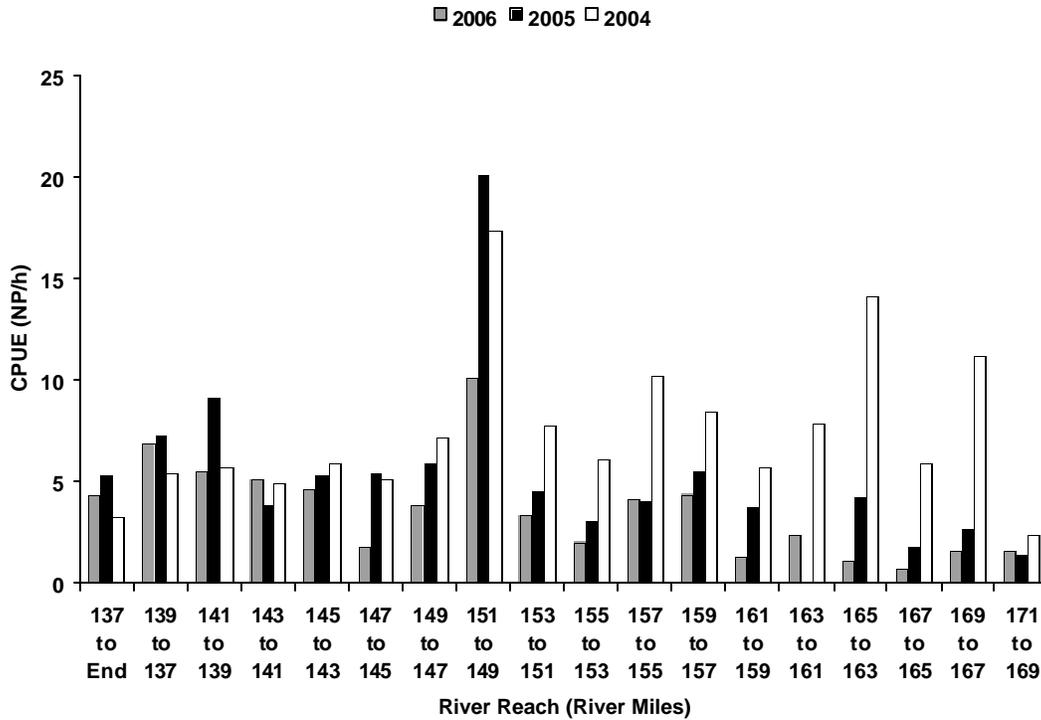


Figure 3. Catch per unit effort (CPUE) for two-mile subreaches in 2004-2006.

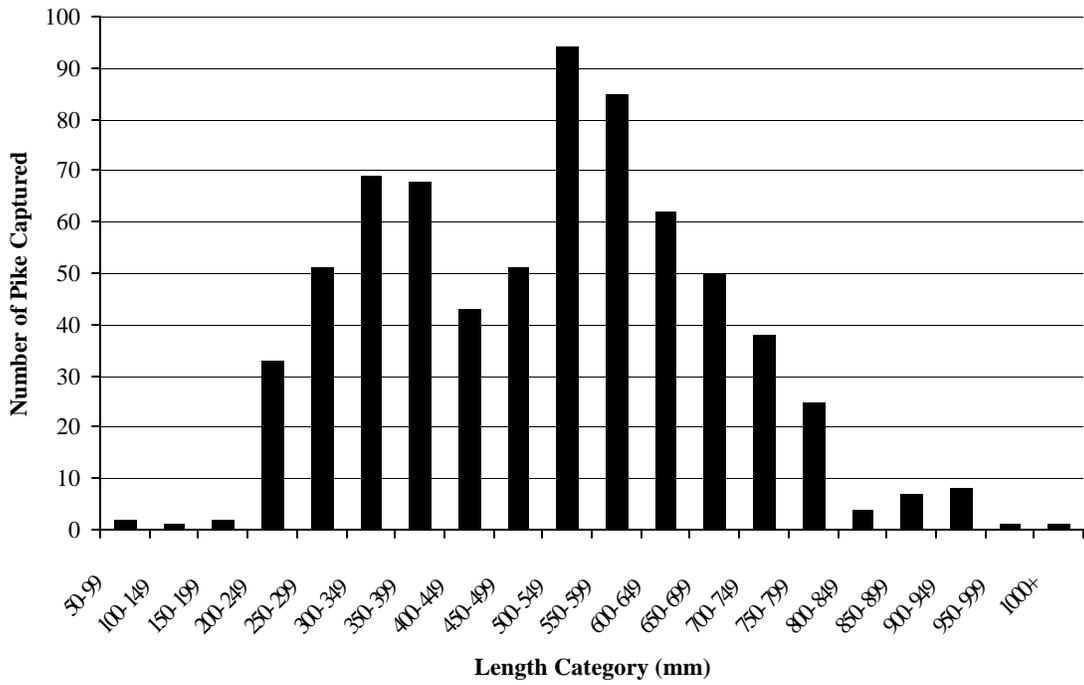


Figure 4. Length frequency of Yampa River northern pike, Spring, 2006.

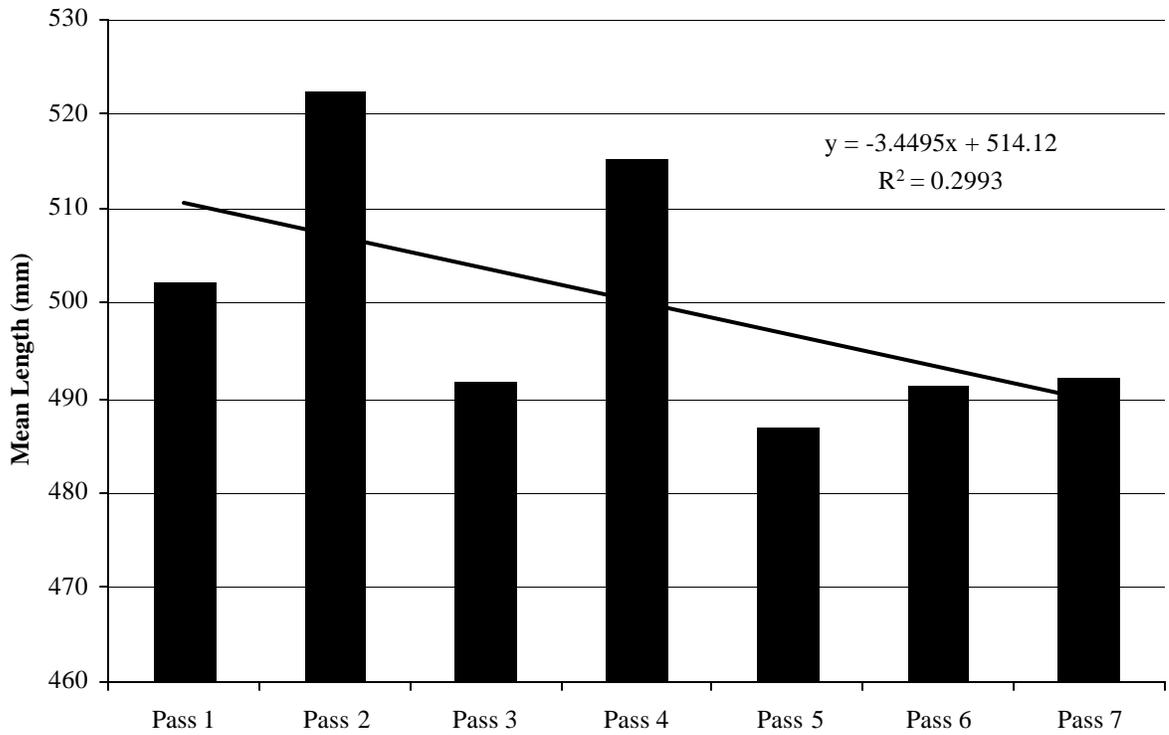


Figure 5. Mean length of northern pike by pass in 2006 in the upper Yampa River, Colorado.

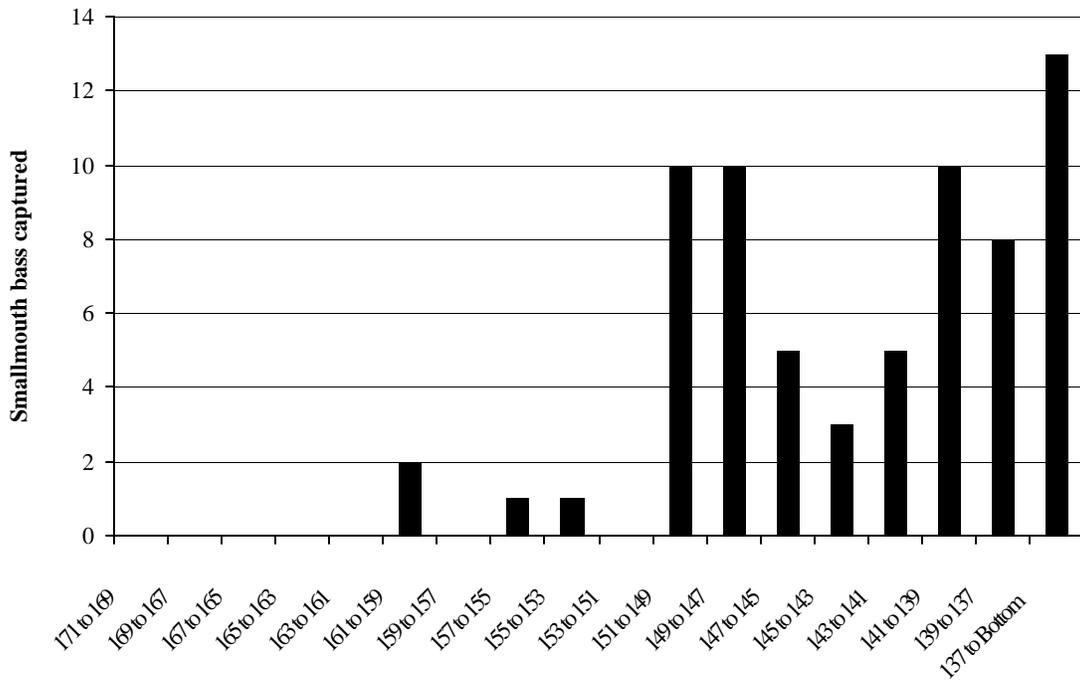


Figure 6. Smallmouth bass encountered by river mile in the Yampa River, Spring 2006.

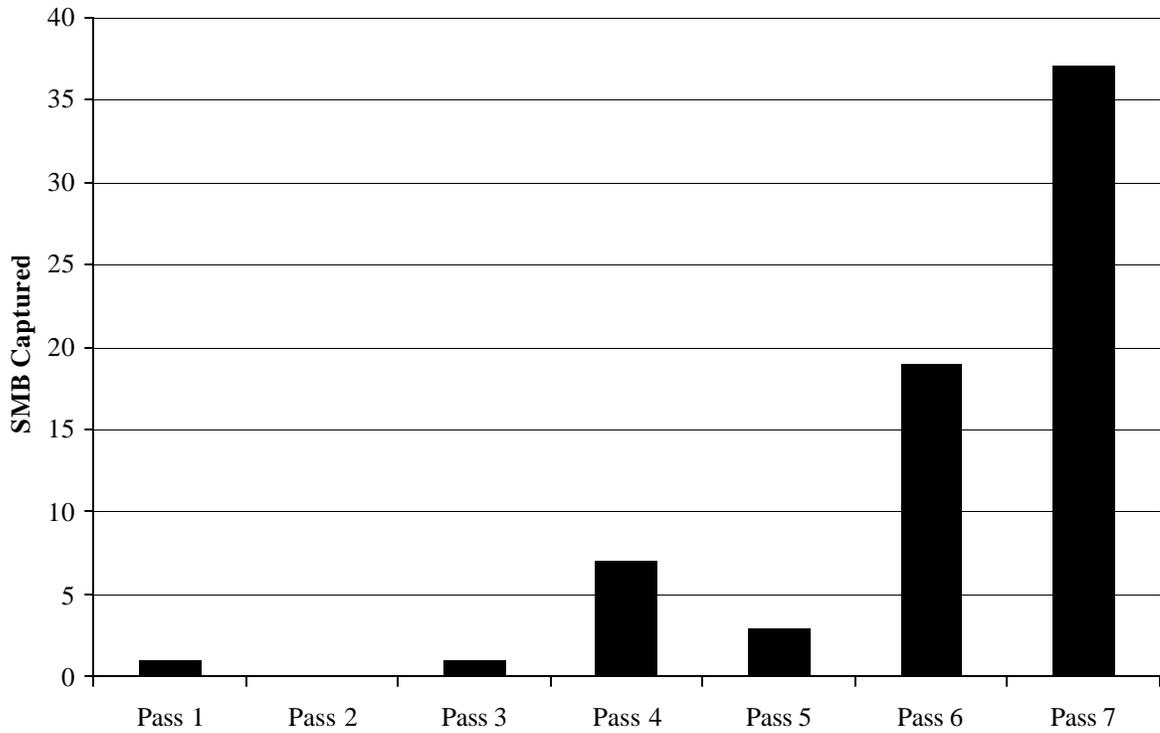


Figure 7. Smallmouth bass encountered by pass in the Yampa River, Spring 2006.

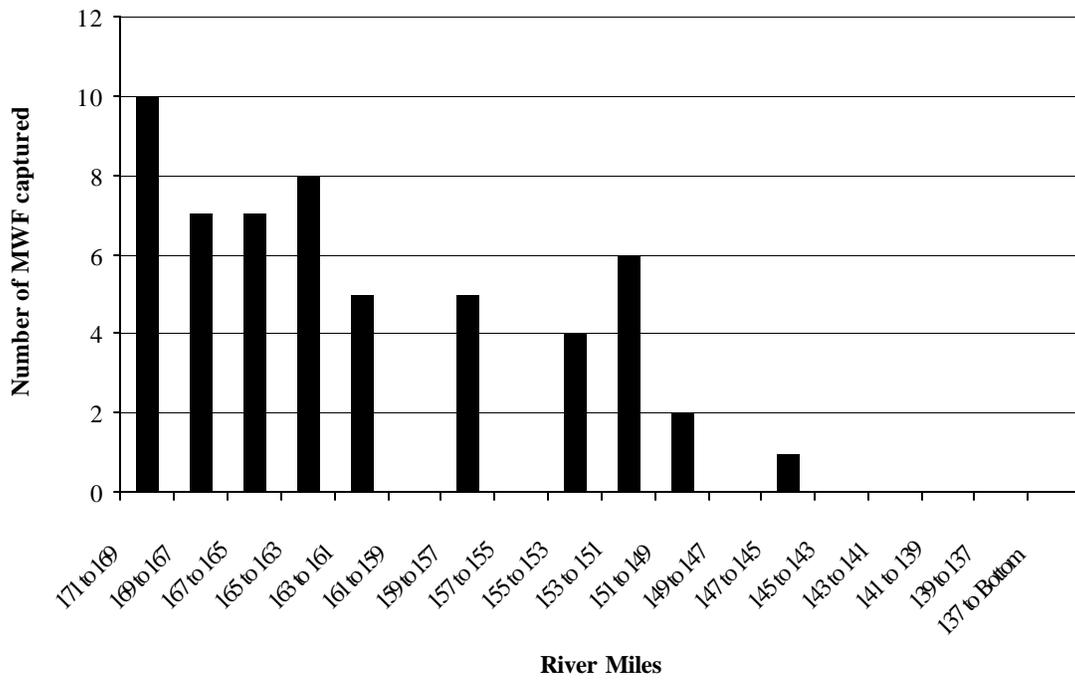


Figure 8. Mountain whitefish observed by reach during pass 6 in the Yampa River, Spring 2006.

References:

- Colby, P. J., P. A. Ryan, D. H. Schupp, and S. L. Serns. 1987. Interactions in north-temperate lake fish communities. *Canadian Journal of Fisheries and Aquatic Sciences* 44:104-128
- Conover, M. C. 1986. Stocking cool-water species to meet management needs. Pages 31-39 *in* R.H. Stroud, ed. *Fish culture in fisheries management*. American Fisheries Society, Bethesda, MD.
- Desantos, J. M. 1991. Ecology of a riverine pike population. *Warmwater Fisheries Symposium I*, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-207.
- Findlay, C. S., D. G. Bert, and L. Zheng. 2000. Effect of introduced piscivores on native minnow communities in Adirondack lakes. *Canadian Journal of Fisheries and Aquatic Sciences* Vol. 57, No. 3
- Finney, S. T. and G. B. Haines. 2005. Translocation of northern pike from the Yampa River upstream of Craig, Colorado. Annual Report to the Recovery Program for the Endangered Fishes of the Upper Colorado River, Project 98b. U. S. Fish and Wildlife Service, Vernal, Utah.
- Hawkins, J. A., and T. P. Nesler. 1991. Nonnative fishes in the upper Colorado River basin: an issue paper. Final Report. Colorado State University Larval Fish Laboratory and Colorado Division of Wildlife, Fort Collins.
- Lentsch, L. D., R. T. Muth, P. D. Thompson, B. G. Hoskins, and T. A. Crowl. 1996. Options for selective control of nonnative fishes in the upper Colorado River basin. Final Report to the Recovery Program for the Endangered Fishes of the Upper Colorado River. Publication 96-14, Utah Division of Wildlife Resources, Salt Lake City, Utah.
- McAda, C. W. 1997. Mechanical removal of northern pike from the Gunnison River, 1995–1996. Final Report to the Recovery Program for the Endangered Fishes of the Upper Colorado River, Project 58. U. S. Fish and Wildlife Service, Grand Junction, Colorado.
- McMahon, T. E. and D. H. Bennett. 1996. Walleye and northern pike: boost or bane to northwest fisheries? *Fisheries*, Vol. 21 No. 8.
- Martinez, P. J. 1995. Coldwater Reservoir Ecology. Colorado Division of Wildlife, Federal Aid in Fish and Wildlife Restoration Project F-242R-2, Job Final Report, Fort Collins.

- Nesler, T. P. 1995. Interactions between endangered fishes and introduced game fishes in the Yampa River, Colorado, 1987-1991. Final Report, Federal Aid Project SE-3. Colorado Division of Wildlife, Fort Collins.
- Pfeifer, F., T. Modde, and S. T. Finney. 2003. Translocation of northern pike from the Yampa River upstream of Craig, Colorado. Annual Report to the Recovery Program for the Endangered Fishes of the Upper Colorado River, Project 98b. U. S. Fish and Wildlife Service, Vernal, Utah.
- Tyus and Saunders. 2000. Non native fish control and endangered fish recovery: lessons from the Colorado River. Fisheries, Vol. 25 No. 9.