

**Implementation of the Northern Pikeminnow Sport-Reward Fishery
In the Columbia and Snake Rivers**

2010 Annual Report

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ABSTRACT

We are reporting on the progress of the Northern Pikeminnow Sport-Reward Fishery (NPSRF) implemented by the Washington Department of Fish and Wildlife (WDFW) on the Columbia and Snake Rivers from May 1 through September 30, 2010. The objectives of this project were to (1) implement a recreational fishery that rewards recreational anglers for harvesting northern pikeminnow ≥ 228 mm (9 inches) total length (TL), (2) collect, compile, and report data on angler participation, catch and harvest of northern pikeminnow and other fish species, as well as success rates of participants during the season, (3) examine collected northern pikeminnow for the presence of external tags, fin clips, and signs of tag loss, (4) collect biological data on northern pikeminnow and other fish species returned to registration stations, (5) scan northern pikeminnow for the presence of Passive Integrated Transponder (PIT) tags implanted into northern pikeminnow by ODFW as secondary tags, and/or from northern pikeminnow containing consumed salmonids with PIT tags, and (6) survey non-returning NPSRF participants targeting northern pikeminnow in order to obtain catch and harvest data on fish species caught.

A total of 174,289 northern pikeminnow ≥ 228 mm, and 6,777 pikeminnow < 228 mm were harvested during the 2010 NPSRF season. There were a total of 3,313 different anglers who spent 25,361 angler days participating in the fishery during the 2010 season. Catch per unit effort for combined returning and non-returning anglers was 6.87 fish/angler day. The Oregon Department of Fish and Wildlife (ODFW) estimated that the northern pikeminnow harvest activities (from the 2010 NPSRF) reported on in this report, resulted in an overall exploitation rate of 18.8% (ODFW personal communication NPMP Coordination meeting 2/17/2011).

Anglers submitted 213 northern pikeminnow with external spaghetti tags, all of which also had ODFW PIT tags. There were also 111 northern pikeminnow with ODFW PIT tags only, but missing spaghetti tags. An additional 109 PIT tags were recovered from juvenile salmonids ingested by northern pikeminnow received during the 2010 NPSRF.

Peamouth *Mylocheilus caurinus*, smallmouth bass *Micropterus dolomieu*, and sculpins *Cottus spp*, were the fish species most frequently harvested by NPSRF anglers targeting northern pikeminnow. The incidental catch of salmonids *Oncorhynchus spp*, by participating anglers targeting northern pikeminnow continued to remain below established limits for the Northern Pikeminnow Management Program.

INTRODUCTION

Mortality of juvenile salmonids *Oncorhynchus spp.* migrating through the Columbia River system is a major concern of the Columbia Basin Fish and Wildlife Program, and predation is an important component of mortality (NPPC 1987a). Northern pikeminnow *Ptychocheilus oregonensis*, formerly known as northern squawfish (Nelson et al. 1998), are the primary piscine predator of juvenile salmonids in the Lower Columbia and Snake River Systems (Rieman et al. 1991). Rieman and Beamesderfer (1990) predicted that predation on juvenile salmonids could be reduced by up to 50% with a sustained exploitation rate of 10-20% on northern pikeminnow > 275 mm FL (11 inches total length). The Northern Pikeminnow Management Program (NPMP) was created in 1990, with the goal of implementing fisheries to achieve the recommended 10-20% annual exploitation on northern pikeminnow >275 mm FL within the program area (Vigg and Burley 1989). In 2000, NPMP administrators reduced the minimum size for eligible (reward size) northern pikeminnow to 228 mm FL (9 inches total length) in response to recommendations contained in a review of NPMP justification, performance, and cost-effectiveness (Hankin and Richards 2000). Beginning in 1991, the Washington Department of Fish and Wildlife (WDFW) was contracted to conduct the NPSRF component of the NPMP (Burley et al. 1992). The NPSRF enlists recreational anglers to harvest reward sized ($\geq 9''$ total length) northern pikeminnow from within program boundaries on the Columbia and Snake Rivers using a monetary reward system. Since 1991, anglers participating in the NPSRF have harvested more than 3.7 million reward sized northern pikeminnow and spent over 743,000 angler days of effort to become the NPMP's most successful component for achieving the annual 10-20% exploitation rate on northern pikeminnow within the program boundaries (Klaybor et al. 1993; Friesen and Ward 1999).

The 2010 NPSRF maintained the tiered angler reward system developed in 1995 (Hisata et al. 1995) which paid anglers higher rewards per fish based on achieving designated harvest levels and a separate bonus reward for returning northern pikeminnow spaghetti tagged by the Oregon Department of Fish and Wildlife (ODFW) as part of the NPSRF's biological evaluation. Catch and harvest data were collected from returning anglers, and non-returning anglers in order to monitor the effects of the NPSRF on other Columbia basin fishes.

The objectives of the 2010 NPSRF were to (1) implement a public fishery that rewards recreational anglers for harvesting northern pikeminnow ≥ 228 mm (9 inches) total length, (2) collect, compile, and report data on angler participation, catch and harvest of northern pikeminnow and other fish species, and success rates of participating anglers during the season, (3) examine collected northern pikeminnow for the presence of external tags, fin-clips, and signs of tag loss, (4) collect biological data on northern pikeminnow and other fish species returned to registration stations, (5) scan northern pikeminnow for the presence of Passive Integrated Transponder (PIT) tags implanted into northern pikeminnow by ODFW as secondary tags, and/or from northern pikeminnow containing consumed salmonids with PIT tags, and (6) survey non-returning fishery participants targeting northern pikeminnow in order to obtain catch and harvest data on fish species caught.

METHODS OF OPERATION

Fishery Operation

Boundaries and Season

The 2010 NPSRF was conducted on the Columbia River from the mouth to the boat-restricted zone below Priest Rapids Dam, and on the Snake River from the mouth to the boat-restricted zone below Hells Canyon Dam (Figure 1). In addition, anglers were allowed to harvest (and submit for payment) northern pikeminnow caught in backwaters, sloughs, and up to 400 feet from the mouth of tributaries within this area. The NPSRF was fully implemented, with all stations operating during a regular season from May 1 through September 30, 2010. In addition, fifteen stations conducted a ten day “post-season extension” beginning on October 1, 2010 in order to take advantage of favorable river conditions and provide anglers with an extended opportunity to harvest northern pikeminnow.

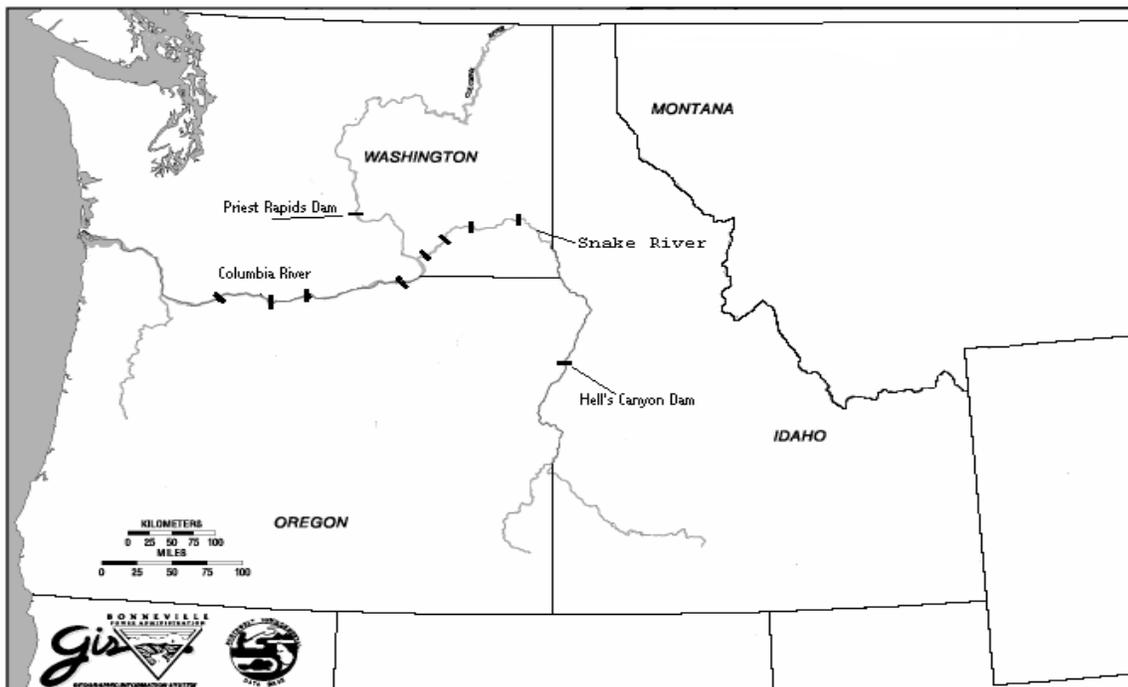


Figure 1. Northern Pikeminnow Sport-Reward Fishery Program Area

Registration Stations

Twenty-one registration stations (Figure 2) were located on the Columbia and Snake Rivers to provide anglers with access to the Sport-Reward Fishery. WDFW technicians set up registration stations daily (seven days a week) at designated locations (normally public boat ramps or parks) which were available to anglers between two and eight hours per day during the season. Technicians registered anglers to participate in the NPSRF, collected angler creel information,

issued pay vouchers to anglers returning with eligible northern pikeminnow, recorded biological data, scanned northern pikeminnow for the presence of PIT tags, and provided Sport-Reward Fishery information to the public. Self-registration boxes were located at each station so anglers could self register when WDFW technicians were not present.



- | | |
|--|-------------------------------------|
| 1. Cathlamet Marina (10am-2 pm) | 12. Bingen Marina (3:30-5:30pm) |
| 2. Willow Grove Boat Ramp (2:30-5:30 pm) | 13. The Dalles Boat Basin (9am-3pm) |
| 3. Rainier Marina (2:30-5:30:00 pm) | 14. Giles French (1pm-5:30 pm) |
| 4. Kalama Marina (11:30am-2 pm) | 15. Arlington (10am-12:30pm) |
| 5. Ridgefield (9am-11 am) | 16. Umatilla Marina (4-6 pm) |
| 6. M. James Gleason Boat Ramp (11:30am-6 pm) | 17. Columbia Point Park (2-6:30 pm) |
| 7. Portco Boat Ramp (9am-11 am) | 18. Vernita Bridge (10am-2:30 pm) |
| 8. Chinook Landing (9am-12pm) | 19. Lyon's Ferry (10:30am-12:30pm) |
| 9. Washougal Boat Ramp (12:30-5 pm) | 20. Boyer Park (10:30 am-2 pm) |
| 10. Beacon Rock (9:30am-12pm) | 21. Greenbelt (3:30-6:30 pm) |
| 11. Cascade Locks Boat Ramp (11am-3:30 pm) | |

Figure 2. 2010 Northern Pikeminnow Sport Reward Fishery Registration Stations

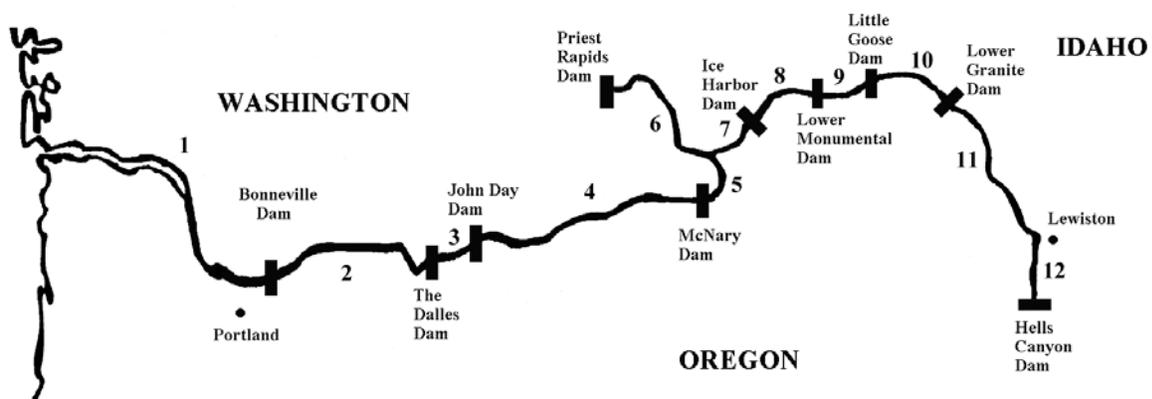
Reward System

The 2010 NPSRF rewarded anglers for harvesting northern pikeminnow $\geq 228\text{mm TL}$ (9 inches) and maintained the tiered angler reward system developed in 1995 (Hisata et al. 1995) which paid anglers a higher reward per fish once they had reached designated harvest levels over the course of the season. To receive payment, anglers returned their catch (daily) to the location where they had registered. WDFW technicians identified the angler's fish and issued a payment

voucher for the total number of eligible northern pikeminnow. Anglers mailed payment vouchers to the Pacific States Marine Fisheries Commission (PSMFC) for redemption. Anglers returning with northern pikeminnow that were spaghetti-tagged by ODFW as part of the biological evaluation of the fishery (Vigg et al. 1990), were issued a separate tag payment voucher that was mailed to ODFW for tag verification before payment was made to the angler by PSMFC. During the 2010 season, the NPSRF retained the pay levels first used in 2004 (Hone et al. 2004) which paid anglers \$4 each for their first 100 northern pikeminnow, \$5 each for numbers 101-400, and \$8 each for all fish over 400. Anglers were paid \$500 for each northern pikeminnow which retained a valid spaghetti tag used by ODFW for the biological evaluation of the NPMP.

Angler Sampling

Angler data and creel data for the NPSRF were compiled from angler registration forms. One registration form represented one angler day. Angler data consisted of name, date, fishing license number, phone number, and city, state, zip code of participating angler. Creel data recorded by WDFW technicians included fishing location (Figure 3), and primary species targeted. Anglers were asked if they specifically fished for northern pikeminnow at any time during their fishing trip. A “No” response ended the exit interview. A “Yes” response prompted technicians to ask the angler (and record data), how many of each species of fish were caught, harvested or released while targeting northern pikeminnow. A fish was considered “caught” when the angler touched the fish, whether it was released or harvested. Fish returned to the water alive were defined as “released”. Fish that were retained by the angler or not returned to the water alive were considered “harvested”.



Fishing Locations:

- | | |
|---|--|
| 1. Below Bonneville Dam | 7. Mouth of the Snake River to Ice Harbor Dam |
| 2. Bonneville Reservoir | 8. McNary Reservoir |
| 3. The Dalles Reservoir | 9. Lower Monumental Reservoir |
| 4. John Day Reservoir | 10. Little Goose Reservoir |
| 5. McNary Reservoir to the Mouth of the Snake River | 11. Lower Granite Reservoir to the Mouth of the Clearwater River |
| 6. Mouth of the Snake River to Priest Rapids Dam | 12. Mouth of Clearwater River to Hell's Canyon Dam |

Figure 3. Fishing location codes used for the 2010 Northern Pikeminnow Sport-Reward Fishery

Returning Anglers

Technicians interviewed all returning anglers at each registration station to obtain any missing angler data, and to record creel data from each participant's angling day. Creel data from caught and released fishes were recorded from angler recollection. Creel data from all harvested fish species were recorded from visual observation.

Non-Returning Anglers

Non-returning angler data were compiled from the pool of anglers who had registered for the NPSRF and targeted northern pikeminnow, but did not return to a registration station to participate in an exit interview. WDFW attempted to survey 20% of the NPSRF's non-returning anglers using a telephone survey in order to obtain creel data from that segment of the NPSRF's participants. To obtain the 20% sample, non-returning anglers were randomly selected from each registration station for each week. A technician called anglers from each random sample until the 20% sample was attained. Non-returning anglers were surveyed with the same exit interview questions used for returning anglers. Anglers were asked: "did you specifically fish for northern pikeminnow at any time during your fishing trip?" With a "Yes" response, anglers were asked to report the number and species of adult and/or juvenile salmonids and the number of reward size northern pikeminnow that were caught and harvested/released while they targeted northern pikeminnow. Angler catch and harvest data were not collected from non-returning anglers who did not target northern pikeminnow on their fishing trip. In addition, non-returning angler catch and harvest data for non-salmonid species were once again collected in 2010 to determine whether there was any variance from the consistent trends observed over the NPSRF's previous 19 year history (Winther et al. 1996), and/or from when this data was last obtained in 2005 (Bruce et al. 2005). These data will not be again collected until 2015 unless results indicate variance from non-returning angler trends observed to date within the Sport-Reward Fishery.

Northern Pikeminnow Handling Procedures

Biological Sampling

Technicians examined all fishes returned to registration stations and recorded species as well as number of fish per species. Technicians checked all northern pikeminnow for the presence of external tags (spaghetti or dart), fin-clip marks, and signs of tag loss. Fork lengths (FL) and sex of northern pikeminnow as well as any other harvested fish species were recorded whenever possible. Complete biological data were collected from all tag-loss and spaghetti tagged northern pikeminnow including FL, sex (determined by evisceration), and scale samples. Spaghetti tagged and tag-loss northern pikeminnow carcasses were then labeled and frozen for data verification and/or tag recovery at a later date. Data from spaghetti tags were recorded on a tag envelope as well as on WDFW data forms. The spaghetti tag was then placed in the tag envelope, stapled to the tag payment voucher and given to the angler to submit to ODFW for verification.

PIT Tag Detection

All northern pikeminnow collected during the 2010 NPSRF were also scanned for passive integrated transponder (PIT) tags. Northern pikeminnow harvested by anglers participating in the NPSRF have been found to ingest juvenile salmonids which have been PIT tagged by other studies within the basin (Glaser et al. 2000). In addition, PIT tags have also been used by ODFW as a secondary mark in all northern pikeminnow fitted with spaghetti tags (beginning in 2003) as part of the NPMP's biological evaluation activities (Takata and Koloszar 2004). The use of PIT tags rather than fin clips as a secondary mark in northern pikeminnow was intended to improve the NPSRF's estimate of tag loss, and result in a more accurate estimate of exploitation for the NPSRF. WDFW technicians were required to scan 100% of all northern pikeminnow returned to registration stations for PIT tags using one of two types of PIT tag "readers". Northern Pikeminnow submitted for payment to the NPSRF were scanned using primarily Destron Fearing portable transceiver systems (model #FS2001F) to record information from PIT tag detections for submission to the Columbia Basin PIT tag information System (PTAGIS). The NPSRF also used Allflex ISO Compatible RF/ID Portable Readers (model #RS601) to scan northern pikeminnow and assist in recovery of initial PIT tag data when the Destron units were not available. Scanning began on the first day of the NPSRF season and continued at all stations throughout the rest of the season. Technicians individually scanned all reward sized northern pikeminnow for PIT tag presence, and complete biological data were recorded from all pikeminnow with positive readings. All PIT tagged northern pikeminnow were labeled and preserved for later dissection and tag recovery. All data were verified after recovery of PIT tags and all PIT tag recovery data were provided to ODFW and the Pit Tag Information System (PTAGIS) on a regular basis.

Northern Pikeminnow Processing

During biological sampling, all northern pikeminnow were either eviscerated (to determine sex), or caudal clipped as an anti-fraud measure to eliminate the possibility of previously processed northern pikeminnow being resubmitted for payment. As in recent years, most northern pikeminnow harvested in 2010 were caudal clipped rather than eviscerated in order to facilitate more accurate recovery of PIT tags. Sampled northern pikeminnow were iced and transported to cold storage facilities from which they were ultimately delivered to rendering facilities for final disposal.

RESULTS AND DISCUSSION

Northern Pikeminnow Harvest

The NPSRF harvested a total of 174,289 reward size northern pikeminnow (≥ 228 mm TL) during the 2010 season, operating during 23 weeks, plus a 10 day extension (at limited stations). The 2010 NPSRF had one less day of fishing than the 2009 NPSRF (Hone et al. 2009), but 2010 harvest was 32,287 fish higher than 2009, and very near the mean 1991-2009 harvest of 176,062 fish (Figure 4). The 2010 NPSRF also achieved an exploitation rate of 18.8% (ODFW personal communication) which was near the upper end of the 10-20% exploitation goal of NPMP. In addition to harvesting 174,289 reward size northern pikeminnow, the 2010 NPSRF also harvested 6,777 northern pikeminnow < 228 mm TL.

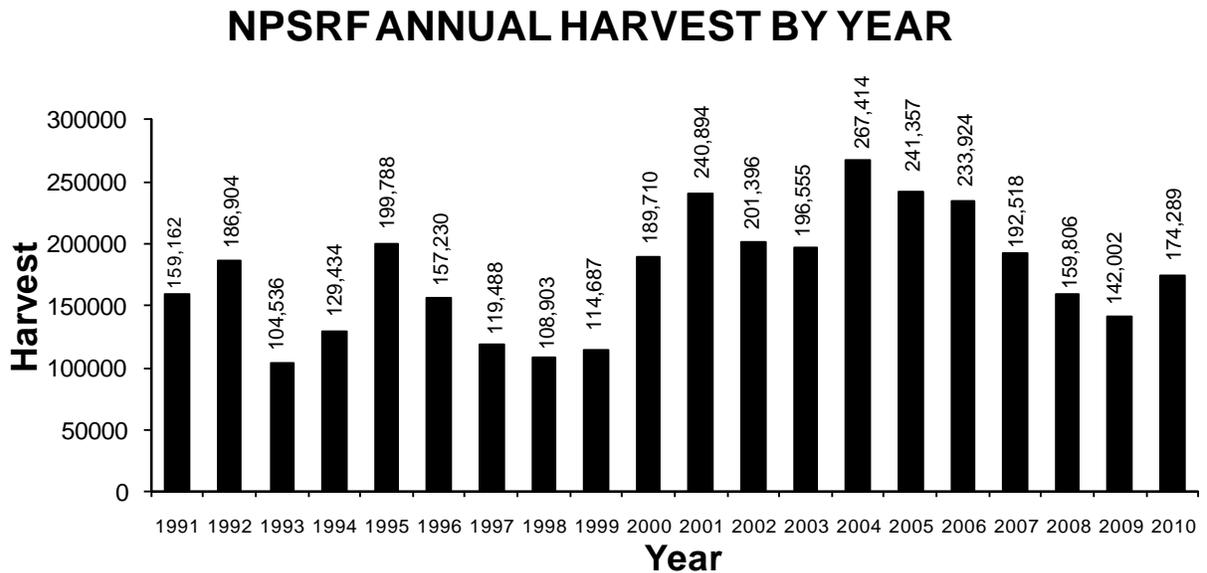


Figure 4. Annual Harvest Totals for the Northern Pikeminnow Sport Reward Fishery

Harvest by Week

Peak weekly harvest for the 2010 NPSRF was 11,574 fish and occurred during week 27 of the season (Figure 5). Mean weekly harvest (regular season + extension) was 7,262 fish, even though the data week for the May 1st opener only included only 2 days and 1,561 fish. Both peak weekly harvest and peak mean harvest were well above 2009 levels (9,217 and 5,950 respectively). Peak harvest was two weeks later than 2009 and weekly harvest totals for the 2010 NPSRF were above the weekly totals for 2009 with the exception of 4 weeks (Figure 6). Peak harvest was one week later than the NPSRF's historical 1991-2009 peak in week 26 (Fox et al. 1999) and other than the second week of the season (week 19), weekly harvest for the 2010

2010 Harvest by Week

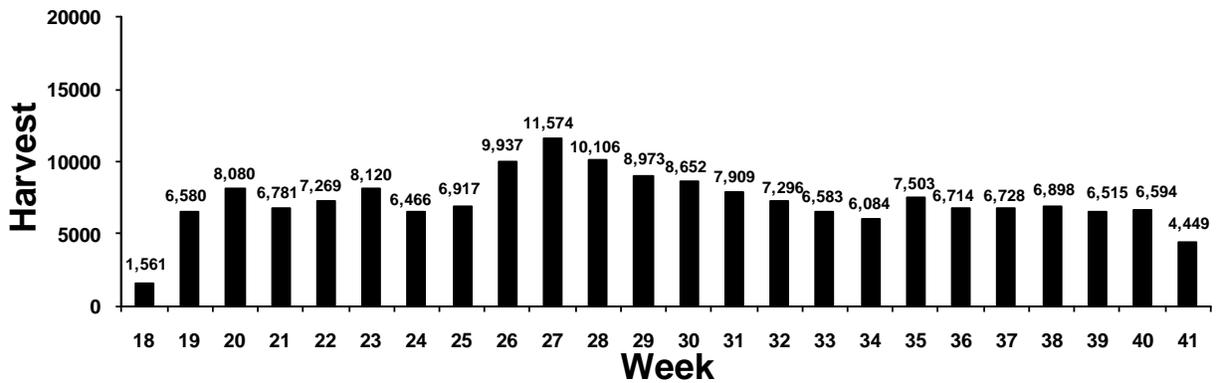


Figure 5. 2010 Weekly Northern Pikeminnow Sport-Reward Fishery Harvest.

2010 Harvest vs 2009 Harvest

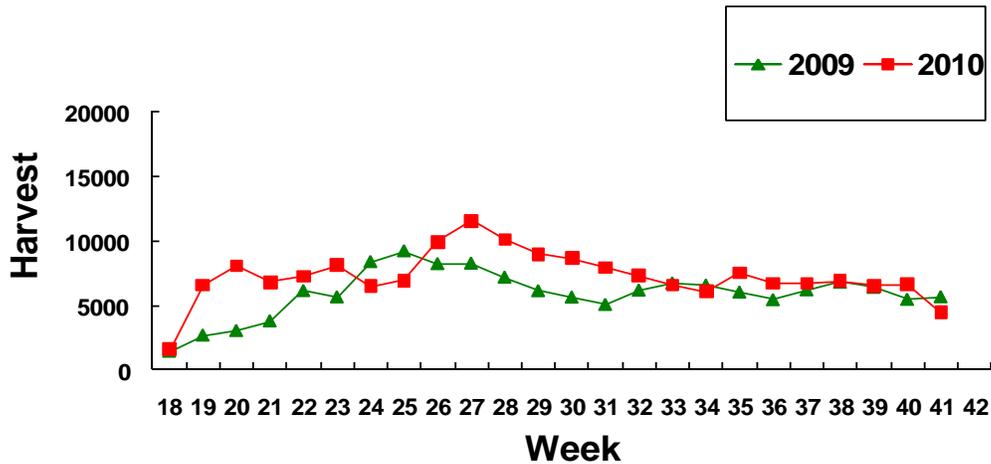


Figure 6. 2010 Weekly NPSRF Harvest vs. 2009 Weekly Harvest.

NPSRF was lower than mean 1991-2009 weekly harvest levels for the first half of the season (Figure 7). Weekly harvest then picked up right before the second half of the season and stayed at or above historical 1991-2009 weekly harvest levels for the remainder of the regular season and through the extension. If it were not for a two week downturn in harvest that coincided with high river flows during weeks 24 and 25, NPSRF harvest in 2010 would have almost exactly followed the seasonal harvest pattern typical for most of the previous 19 NPSRF seasons.

2010 Harvest vs. Mean 1991-2009 Harvest

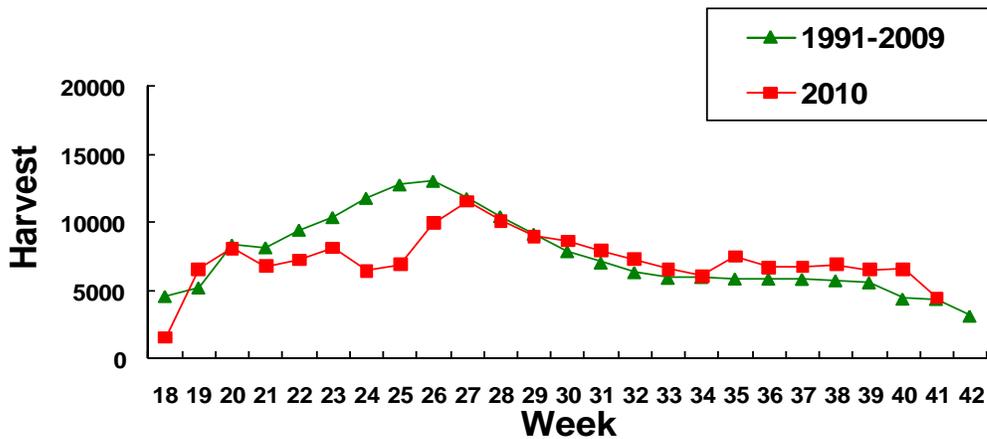


Figure 7. Comparison of 2010 NPSRF Weekly Harvest to 1991-2009 Mean Weekly Harvest.

Harvest by Fishing Location

The mean harvest by fishing location for the 2010 NPSRF was 14,524 northern pikeminnow and ranged from 73,499 reward size northern pikeminnow in fishing location 01 (below Bonneville Dam) to 300 northern pikeminnow from fishing location 07 (Mouth of the Snake River to Lower Monumental Dam) (Figure 8). Harvest from Fishing Location 01 (the Columbia river below Bonneville Dam) accounted for 42% of total NPSRF harvest and was once again the highest producing area as it has been for each year since 1991. Fishing location 02 (Bonneville Reservoir) was the second best area (in terms of total harvest) accounting for 22% of total 2010 NPSRF harvest. Bonneville Pool (Fishing location 02) reclaimed the number two harvest position for the first time since 2007 returning to the high harvest levels first documented during the 2004 NPSRF (Hone et al. 2004). Once again, the primary area of harvest for this fishing location is in the tailrace area of The Dalles Dam, especially during the first 6 weeks of the season where NPSRF technicians recorded exceptionally large catches from anglers fishing exclusively in this area. The area immediately below Lower Granite Dam (Fishing location 10) also continued to be a top producer with 18% of total 2010 NPSRF harvest.

2010 HARVEST BY FISH LOCATION

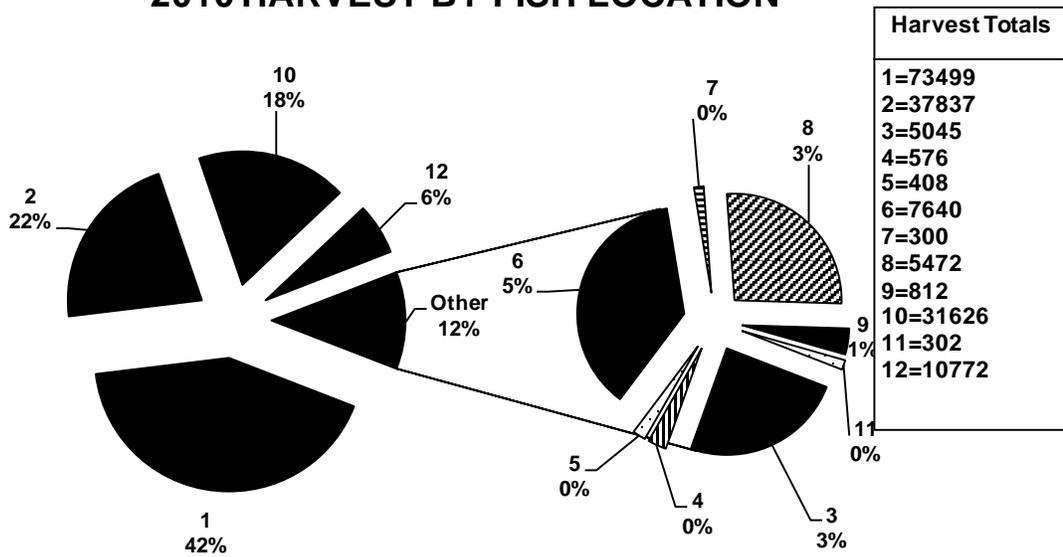


Figure 8. 2010 Northern Pikeminnow Sport-Reward Fishery Harvest by Fishing Location.*

*Fishing Location Codes for Columbia River; 1 = Below Bonneville Dam, 2 = Bonneville Reservoir, 3 = The Dalles Reservoir, 4 = John Day Reservoir, 5 = McNary Dam to the mouth of the Snake River, 6 = Mouth of the Snake River to Priest Rapids Dam. Fishing Location Codes for the Snake River; 7 = Mouth of the Snake River to Ice Harbor Dam, 8 = Ice Harbor Reservoir, 9 = Lower Monumental Reservoir, 10 = Little Goose Reservoir, 11 = Lower Granite Dam to the mouth of the Clearwater River, 12 = Mouth of the Clearwater River to Hell’s Canyon Dam.

Harvest by Registration Station

Harvest in 2010 was up (from 2009 levels) at 10 of the 18 registration stations that were also operated during the 2009 NPSRF (there were 3 new stations in 2010). Boyer Park was the NPSRF’s top producing station for the fourth consecutive season (Figure 9). Boyer Park anglers harvested 30,971 northern pikeminnow (up from 27,434 in 2009), equaling 17.8% of the total 2010 NPSRF harvest. The average harvest per registration station was 8,299 reward size northern pikeminnow, up from 7,889 per station in 2009. The registration station with the smallest harvest was the new station at Arlington where anglers harvested only 62 northern pikeminnow during the 2010 season. The Bingen and Lyon’s Ferry registration stations showed the largest increase in harvest, more than doubling their harvest totals in 2010 (from 2,073 at Bingen and 1,961 at Lyon’s Ferry in 2009).

Harvest By Registration Station

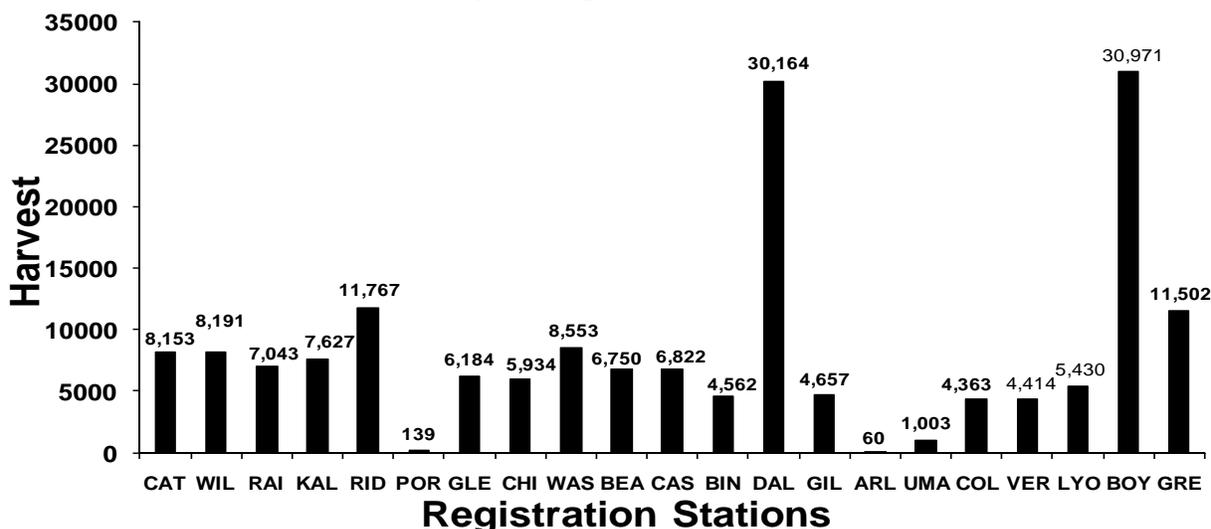


Figure 9. 2010 Northern Pikeminnow Sport-Reward Fishery Harvest by Registration Station.

CAT-Cathlamet, WIL-Willow Grove, RAI-Rainier, KAL-Kalama, RID-Ridgefield, POR-Portco, GLE-Gleason, CHI-Chinook, WAS-Washougal, BEA-Beacon Rock, CAS-Cascade Locks, BIN-Bingen, DAL- The Dalles, GIL-Giles, ARL-Arlington, UMA - Umatilla, COL - Columbia Point, VER - Vernita, LYO - Lyon's Ferry, BOY-Boyer Park, GRE-Greenbelt.

Harvest by Species/ Incidental Catch

Returning anglers

In addition to northern pikeminnow, returning anglers participating in the 2010 NPSRF reported that they incidentally caught the salmonids listed in Table 1. Incidental salmonid catch by returning NPSRF anglers consisted mostly of juvenile chinook and unknown species of trout.

Table 1. Catch and Harvest of salmonids by Returning Anglers Targeting Northern Pikeminnow in 2010.

Salmon			
Species	Caught	Harvest	Harvest Percent
Chinook (Adult)	33	4	12.12%
Chinook (Jack)	14	7	50.00%
Chinook (Juvenile)	282	0	0%
Coho (Adult)	0	0	0
Coho (Juvenile)	3	0	0%
Cutthroat (Unknown)	12	4	33.33%
Steelhead Adult (Hatchery)	33	13	39.39%
Steelhead Adult (Wild)	32	0	0%
Steelhead Juvenile (Hatchery)	41	0	0%
Steelhead Juvenile (Wild)	14	0	0%
Trout (Unknown)	101	7	6.93%

Anglers reported that all juvenile salmonids caught during the 2010 NPSRF were released. Technicians recorded all juvenile steelhead caught by NPSRF anglers (except those specifically reported as missing the adipose fin), as “wild”. Harvested adult salmonids (hatchery fin-clipped chinook and steelhead with missing adipose fins) were caught incidentally during the 2010 NPSRF, but were only retained during legal salmonid fisheries. Instances where NPSRF anglers reported harvesting “trout” from the Snake River during a legal fishery are typically residualized hatchery steelhead smolts which are caught and kept by anglers, and misidentified as trout. Any NPSRF angler who reports illegally harvesting salmonids during the exit interview (whether juvenile or adult salmonids), are immediately reported to the appropriate enforcement entity by WDFW technicians.

Other fish species incidentally caught by returning NPSRF anglers targeting northern pikeminnow were most often peamouth, smallmouth bass, Sculpin, White Sturgeon, Yellow Perch, and Suckers (Table 2).

Table 2. Catch and Harvest of non-salmonids by Returning Anglers Targeting Northern Pikeminnow in 2010.

Non-Salmonid			
Species	Caught	Harvest	Harvest Percent
Northern Pikeminnow $\geq 228\text{mm}$	174,309	174,289	99.99%
Northern Pikeminnow $< 228\text{mm}$	55,130	6,777	12.29%
Peamouth	36,905	11,636	31.53%
Smallmouth Bass	12,721	1,214	9.54%
Sculpin (unknown)	8,408	4,270	50.78%
White Sturgeon	3,691	49	1.33%
Yellow Perch	3,518	733	
Sucker (unknown)	2,859	349	12.21%
Starry Flounder	980	112	11.43%
Catfish (unknown)	913	152	16.65%
Walleye	791	456	57.65%
Carp	543	109	20.07%
Chiselmouth	500	54	10.80%
American Shad	161	82	50.93%
Bullhead (unknown)	144	21	14.58%
Redside Shiner	131	0	0%
Sandroller	116	0	0%
Pumpkinseed	84	69	82.14%
Bluegill	84	19	22.62%
Whitefish	24	7	29.17%
Largemouth Bass	21	3	14.29%
Crappie (unknown)	12	0	0%

Non-returning Anglers Catch and Harvest Estimates

We randomly surveyed 1,913 non-returning anglers (24% of all non-returning anglers) to record their catch and/or harvest of reward sized northern pikeminnow or any salmonid species. Catch and harvest data for other fish species caught by non-returning anglers were also collected in 2010 per NPMP protocol (Fox et al. 1999). Surveyed non-returning anglers targeting northern pikeminnow reported that they caught and/or harvested the fish species listed in column 1 of Table 3 during the 2010 NPSRF. A simple estimator was applied to the catch and harvest totals obtained from the surveyed anglers to obtain Total Catch, and Total Harvest estimates for all non-returning anglers participating in the 2010 NPSRF. Estimated totals are listed in columns 4 and 5 of Table 3. Estimated catch for non-returning anglers participating in the 2010 NPSRF was higher for the 11 species highlighted below (compared to non-returning anglers from the 2005 NPSRF), although estimated harvest for those species was below 2005 levels for all species except yellow perch, suckers, and adult chinook salmon. Catch and harvest levels for all species by non-returning NPSRF anglers continued to remain low in 2010, illustrating once again that non-returning anglers are less proficient at catching fish than are returning anglers. We anticipate once again collecting full catch and harvest data for all species from surveyed non-returning anglers in 2015 to determine whether this trend has changed.

Table 3. 2010 NPSRF Catch and Harvest for surveyed Non-returning Anglers and Estimated non-return angler catch and harvest totals.

Species	<u>Caught</u>	<u>Harvested</u>	<u>%Harvested</u>	<u>Estimated Total Catch</u>	<u>Estimated Total Harvest</u>
Northern Pikeminnow \geq 228 mm	74	58	78.4	309	242
Northern Pikeminnow < 228 mm	1063	36	3.4	4433	150
Peamouth	1111	157	14.1	4633	655
Smallmouth bass	762	114	15.0	3178	475
White Sturgeon	185	0	0.0	771	0
Yellow Perch	179	6	3.4	746	25
Bullhead	177	11	6.2	738	46
Sculpin (combined species)	165	0	0.0	688	0
Sucker (combined species)	121	22	18.2	505	92
Starry Flounder	58	1	1.7	242	4
Channel Catfish	48	10	20.8	200	42
Carp	40	22	55.0	167	92
Walleye	23	17	73.9	96	71
Chiselmouth	12	7	58.3	50	29
American Shad	4	0	0.0	17	0
Crappie	2	0	0.0	8	0
Trout, unknown	37	0	0.0	154	0
Steelhead (juvenile – adipose absent)	12	0	0.0	50	0
Steelhead (adult – adipose absent)	3	0	0.0	13	0
Chinook Salmon (adult)	2	1	50.0	8	4
Chinook Salmon (jack)	1	0	0.0	4	0
Chinook Salmon (juvenile)	1	0	0.0	4	0
Steelhead (adult - adipose present)	1	0	0.0	4	0
Steelhead (juvenile - adipose present)	1	0	0.0	4	0

N = 7,972 n = 1,913

Fork Length Data

The length frequency distribution of harvested northern pikeminnow (≥ 200 mm) from the 2010 NPSRF is presented in Figure 10. Fork length data for a total of 65,914 northern pikeminnow (38% of total) were taken during the 2010 NPSRF. The mean fork length for all measured northern pikeminnow (≥ 200 mm) in 2010 was 281.7 mm (SD= 70.6 mm), down from 291.4 in 2009.

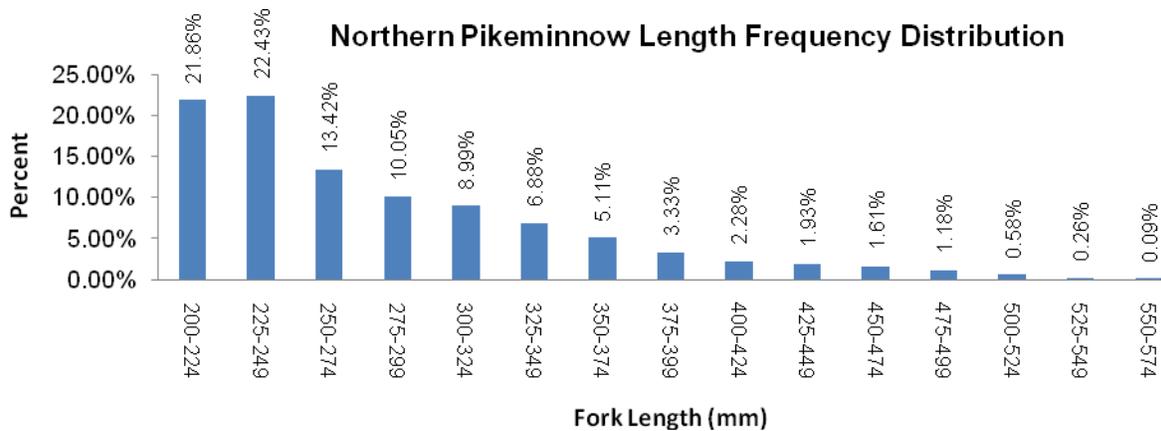


Figure 10. Length frequency distribution of northern pikeminnow ≥ 200 mm FL from 2010 NPSRF.

Angler Effort

The 2010 NPSRF recorded total effort of 25,361 angler days spent during the season, a decrease of 3,751 angler days from the effort total of the previous year (Hone et al. 2009) (Figure 11). When total effort is divided into returning and non-returning angler days, 17,389 angler days (69%) were recorded by returning anglers, and 7,972 were non-returns. The percentage of returning anglers showed an increase from 2009 (66%) and returned to the upward trend that the NPSRF had seen prior to 2008. In addition, 69% of total effort, and 85% of returning angler effort (14,728 angler days), was attributed to successful anglers who harvested at least 1 northern pikeminnow in 2009.

NPSRF ANNUAL EFFORT BY YEAR

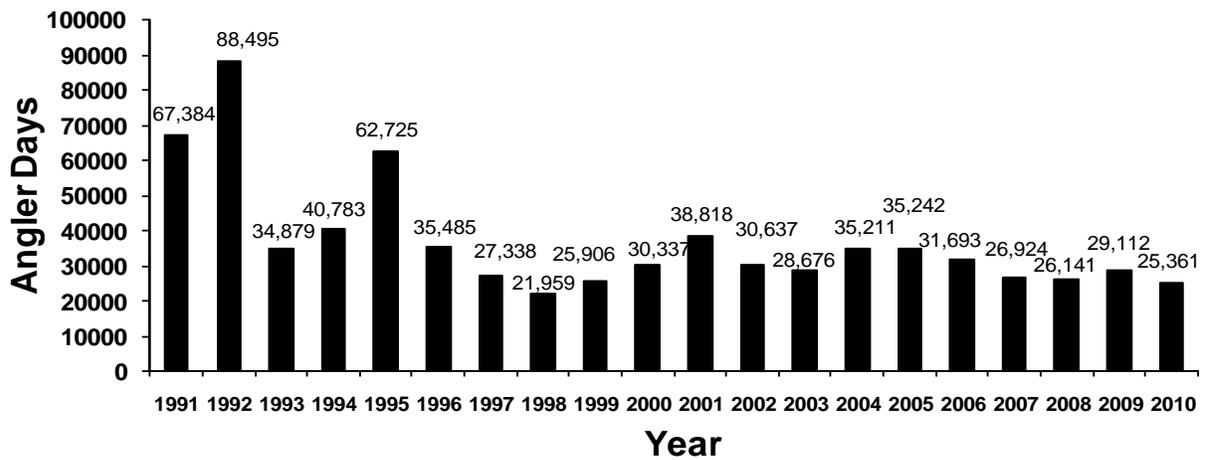


Figure 11. Annual Northern Pikeminnow Sport-Reward Fishery Effort.

Effort by Week

Mean weekly effort for the 2010 NPSRF was 1,057 angler days during the season, with the peak occurring in the third week of the season and then spiking again in week 26 (Figure 12). Peak weekly effort typically occurs near peak weekly harvest in mid to late June, but this season there were two peaks as excellent angling success during the first three weeks of the season at The Dalles station resulted in an early surge of effort which was later followed by the traditional peak near the harvest peak. Overall mean weekly effort decreased from 1,213 in 2009 to 1,057 in 2010 (Winther et al. 2008). The weekly effort totals for the 2009 NPSRF generally followed the pattern of previous seasons although lower than historical 1991-2009 effort levels that were buoyed by heavy participation in the first few years of the NPSRF (Figure 13).

2010 Effort by Week

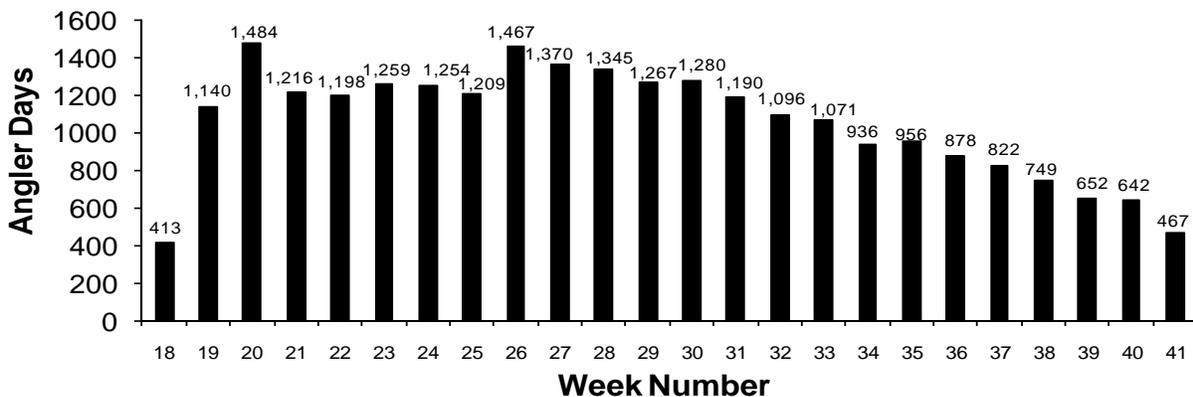


Figure 12. 2010 Weekly Northern Pikeminnow Sport-Reward Fishery Effort vs 2009 Weekly Effort.

2010 Effort vs. Mean 1991-2009 Effort

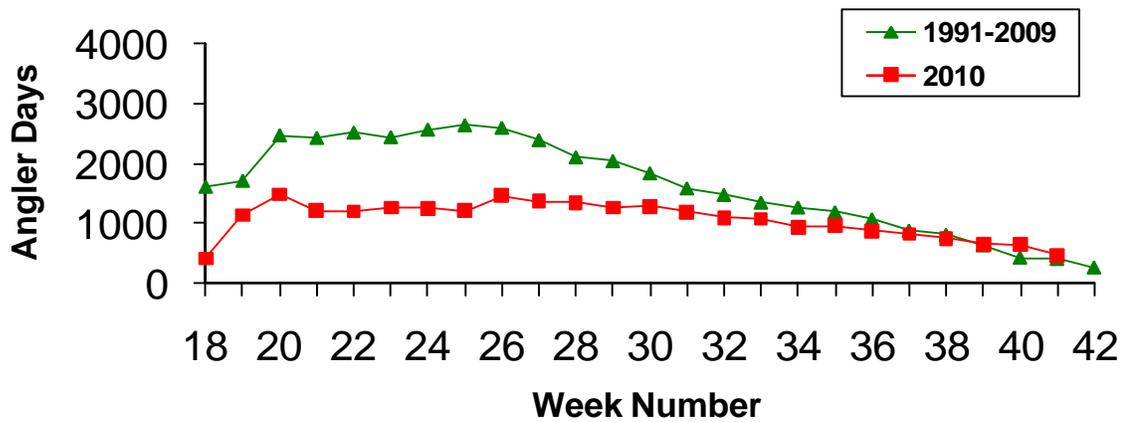


Figure 13. 2010 NPSRF Weekly Effort vs. Mean 1991-2009 Effort.

Effort by Fishing Location

Mean annual effort by fishing location for the 2010 NPSRF (returning anglers only) was 1,449 angler days compared to 1,590 angler days in 2009. Effort totals ranged from 7,567 angler days recorded below Bonneville Dam (fishing location 01) to only 36 angler days spent in fishing location 07 on the Snake River (Mouth of the Snake River to Ice Harbor Dam) (Figure 14). A 23.8% increases in effort at fishing locations 02 (The Dalles Dam to John Day Dam) helped compensate for the fact that effort decreased at eight of the twelve NPSRF fishing locations.

2010 Returning Angler Effort by Fish Location

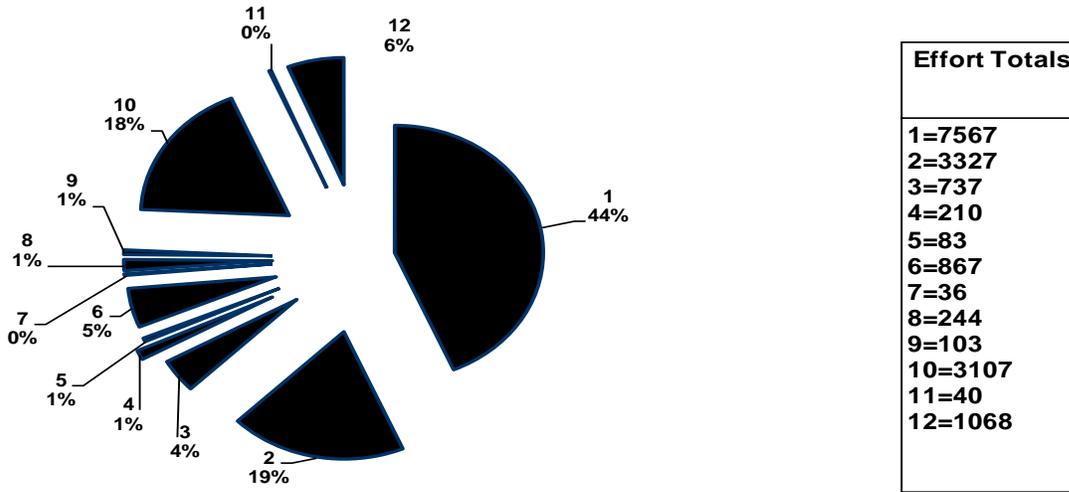


Figure 14. 2010 NPSRF Angler Effort by Fishing Location (returning anglers only).*

*Fishing Location Codes for Columbia River; 1 = Below Bonneville Dam, 2 = Bonneville Reservoir, 3 = The Dalles Reservoir, 4 = John Day Reservoir, 5 = McNary Dam to the mouth of the Snake River, 6 = Mouth of the Snake River to Priest Rapids Dam. Fishing Location Codes for the Snake River; 7 = Mouth of the Snake River to Ice Harbor Dam, 8 = Ice Harbor Reservoir, 9 = Lower Monumental Reservoir, 10 = Little Goose Reservoir, 11 = Lower Granite Dam to the mouth of the Clearwater River, 12 = Mouth of the Clearwater River to Hell's Canyon Dam.

Effort by Registration Station

Mean effort per registration station during the 2010 NPSRF was 1,208 angler days compared to 1,617 angler days in 2009. Effort totals ranged from 3,932 angler days at The Dalles station to 39 angler days at the new Arlington station (Figure 15). Effort during the 2010 NPSRF decreased at fifteen of the eighteen registration stations that were also operated in 2009. Effort increased at three stations, most notably at the Bingen station where effort increased by 61% with an additional 311 angler days spent in 2010. We saw the largest decline in effort (from 2009) at the Cathlamet station where we lost 975 angler days of effort.

Effort By Registration Station

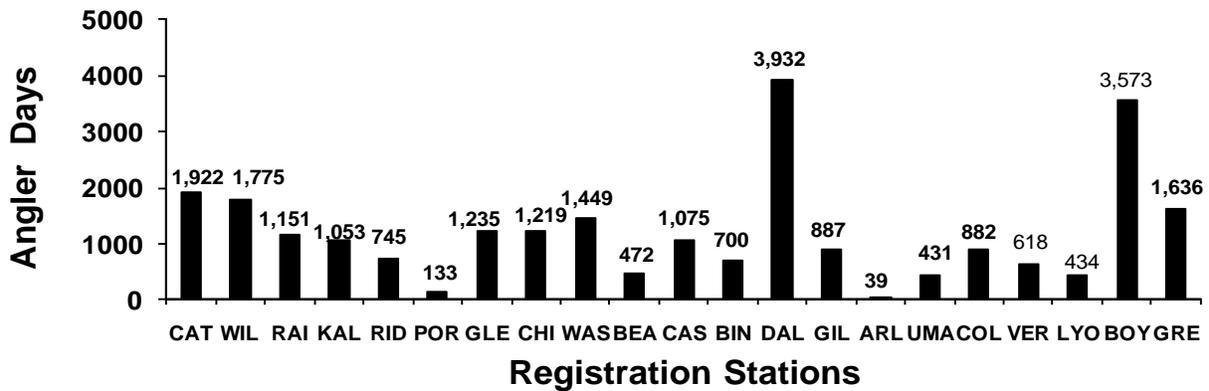


Figure 15. 2010 Northern Pikeminnow Sport-Reward Fishery Angler Effort by Registration Station.

CAT-Cathlamet, WIL-Willow Grove, RAI-Rainier, KAL-Kalama, RID-Ridgefield, POR-Portco, GLE-Gleason, CHI-Chinook, WAS-Washougal, BEA-Beacon Rock, CAS-Cascade Locks, BIN-Bingen, DAL-TheDalles, GIL-Giles, ARL-Arlington, UMA-Umatilla, COL-Columbia Point, VER-Vernita, LYO-Lyon’s Ferry, BOY-Boyer Park, GRE-Greenbelt.

Catch Per Angler Day (CPUE)

The 2010 NPSRF recorded an overall (returning + non-returning anglers) catch per unit of effort (CPUE) of 6.87 northern pikeminnow harvested per angler day during the 2010 season. This catch rate increased from 4.88 in 2009 (Hone et al. 2009) and was also higher than the 6.11 CPUE recorded during the 2008 NPSRF (Winther et al. 2008) (Figure 16). Up through the 2007 season, angler CPUE had increased steadily throughout the NPSRF’s history. During both the 2008 and 2009 NPSRF seasons, angler CPUE was considerably lower, most likely due to the influx of new or inexperienced anglers attracted to the NPSRF by the Pikeminnow Angler Random Drawing incentive (Hone et al. 2009). The 2010 NPSRF was conducted without the use of any random drawings or other incentives attracting inexperienced anglers and angler CPUE rebounded to near pre-drawing (2007) levels. Returning angler CPUE during the 2010 NPSRF was 10.02 northern pikeminnow per angler day, up from both 2009 and 2008 (7.44 and 8.86 respectively), and near the 2007 level of 10.5. We estimate that CPUE for non-returning anglers is 0.03 reward sized northern pikeminnow per angler day based on 2010 NPSRF phone survey results.

CPUE -- Linear 1991-2010 Overall CPUE

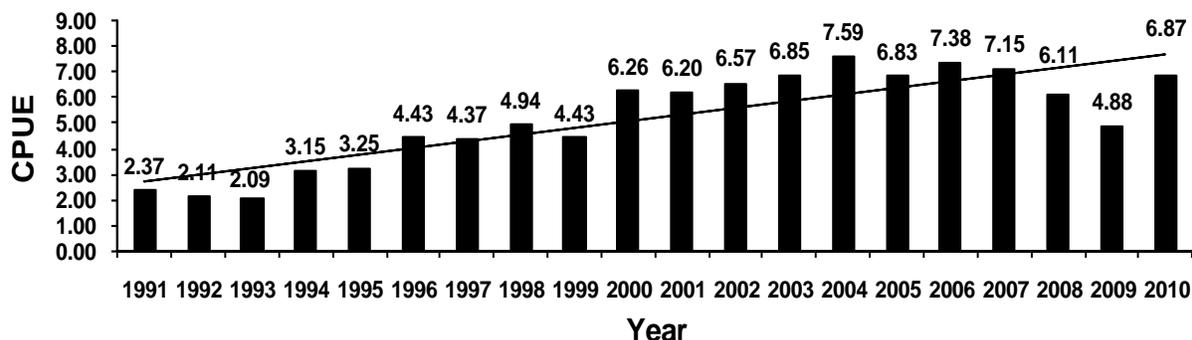


Figure 16. Annual NPSRF CPUE (returning + non-returning anglers) for the years 1991-2010.

CPUE by Week

Mean angler CPUE by week for the 2010 NPSRF was 7.05 fish per angler day compared to 5.45 in 2009. CPUE ranged from 3.78 in week 18 (May 1-2) to a peak of 10.27 in week 40 (September 27-October 3) (Figure 17). As has historically been the case, weekly CPUE for the 2010 NPSRF followed the two peak pattern where catch rates spike upward near peak harvest (week 26) and then again late in the season.

2010 CPUE By Week

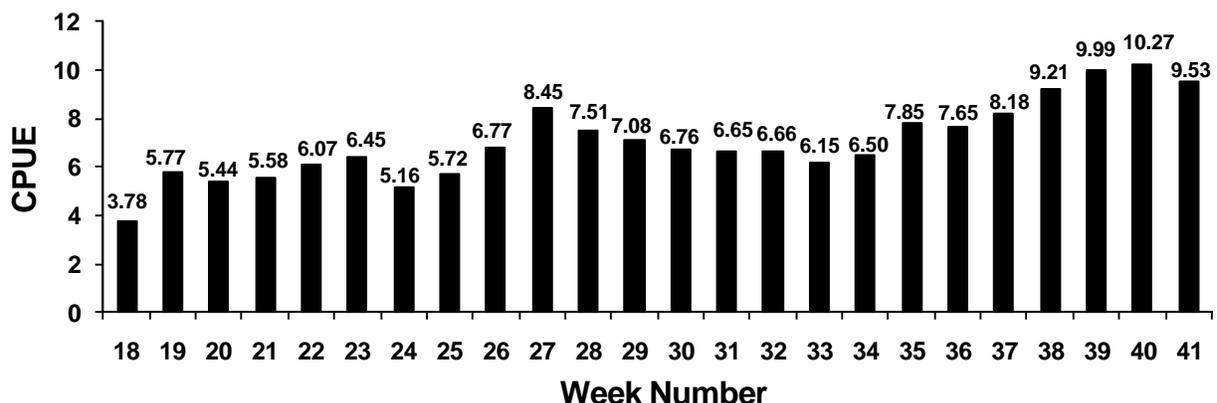


Figure 17. 2010 Northern Pikeminnow Sport-Reward Fishery Angler CPUE by Week.

CPUE by Fishing Location

Angler success rates for the 2010 NPSRF, as indicated by CPUE, are available for returning anglers only and varied by fishing location. Success rates ranged from a high of 22.43 fish per angler day in fishing location 08 (Ice Harbor Reservoir) to 2.74 fish per angler per day in fishing location 04 (John Day Dam to McNary Dam) (Figure 18). Catch rates were up from 2009 at all fishing locations except The Dalles and John Day Pools (Fishing Locations 03 and 04 respectively) as well as fishing location 07 (the mouth of the Snake River to Ice Harbor Dam). The average CPUE by fishing location was 9.24 northern pikeminnow per angler day in 2010 compared to 7.52 in 2009.

2010 CPUE By Fishing Location

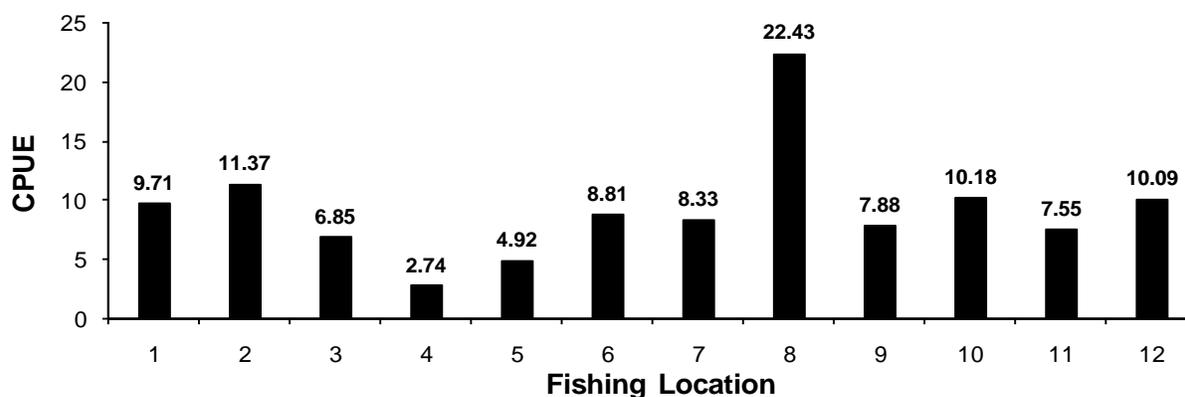


Figure 18. 2010 Northern Pikeminnow Sport-Reward Fishery Angler CPUE by Fishing Location.*

*Fishing Location Codes for Columbia River; 1 = Below Bonneville Dam, 2 = Bonneville Reservoir, 3 = The Dalles Reservoir, 4 = John Day Reservoir, 5 = McNary Dam to the mouth of the Snake River, 6 = Mouth of the Snake River to Priest Rapids Dam. Fishing Location Codes for the Snake River; 7 = Mouth of the Snake River to Ice Harbor Dam, 8 = Ice Harbor Reservoir, 9 = Lower Monumental Reservoir, 10 = Little Goose Reservoir, 11 = Lower Granite Dam to the mouth of the Clearwater River, 12 = Mouth of the Clearwater River to Hell's Canyon Dam.

CPUE by Registration Station

For the second consecutive year the registration Station with the highest CPUE during the 2010 NPSRF was the Ridgefield station where anglers averaged 15.79 northern pikeminnow per angler day (Figure 19). The registration station with the lowest CPUE was the new Portco station with a CPUE of 1.05 northern pikeminnow per angler day. The station average for angler CPUE was 6.62, up from 4.94 in 2009. Average angler CPUE by registration station increased at all but four stations during the 2010 NPSRF, and the four that did decline were down just slightly from 2009. The Lyon's Ferry station had the largest change in CPUE, more than doubling from 5.04 in 2009 to 12.51 in 2010.

2010 CPUE By Registration Station

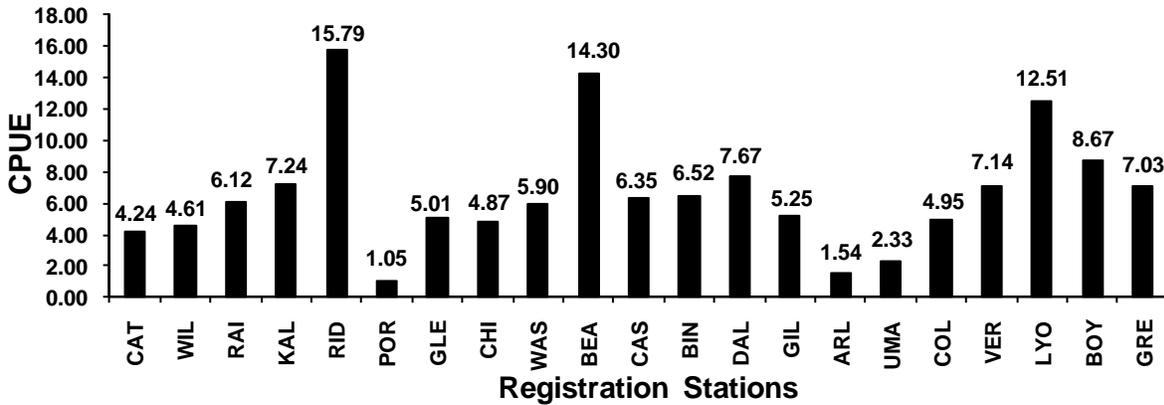


Figure 19. 2010 Northern Pikeminnow Sport-Reward Fishery Angler CPUE by Registration Station.

CAT-Cathlamet, WIL-Willow Grove, RAI-Rainier, KAL-Kalama, RID-Ridgefield, POR-Portco, GLE-Gleason, CHI-Chinook, WAS-Washougal, BEA-Beacon Rock, CAS-Cascade Locks, BIN-Bingen, DAL-TheDalles, GIL-Giles, ARL-Arlington, UMA-Umatilla, COL-Columbia Point, VER-Vernita, LYO-Lyon’s Ferry, BOY-Boyer Park, GRE-Greenbelt.

Angler Totals

There were 3,313 separate anglers who participated in the 2010 NPSRF, an decrease of 1,166 participants from 2009 (Hone et al. 2009). One thousand, three hundred and eleven of these anglers (39.6% of total vs 35.5% in 2010) were classified as successful since they harvested at least one reward size northern pikeminnow (for which a voucher was issued) during the 2010 season. Of the successful anglers, 82% (1,075 anglers) sent in their vouchers to PSMFC for payment (PSMFC personal communication). The average successful angler harvested 133 northern pikeminnow during the 2010 NPSRF, although when we break down the 1,311 successful anglers by tier, most anglers (1,091 anglers = 83%) harvested fewer than 100 northern pikeminnow and were classified as Tier 1 anglers (Figure 20). One hundred and eleven anglers (9%) reached Tier 2 status by harvesting between 101 and 400 northern pikeminnow, and 109 anglers (8%) reached Tier 3 status by harvesting more than 400 northern pikeminnow in 2010. The 109 anglers who reached Tier 3 also represent only 3.3% of all angler participants (both returning and non-returning anglers) during the 2010 NPSRF. The number of anglers reaching each of the three tiers during the 2010 NPSRF increased at Tier 3, was equal at Tier 2 and declined at Tier 1 compared to the previous year. The number of anglers at Tier 1 (<100 fish) during the 2010 NPSRF declined by 294 anglers from 2009 which was nearly the identical number of anglers gained in 2009 (281) from 2008 as a result of the random drawings (Winther et al 2008).

Percent of NPSRF Anglers by Tier

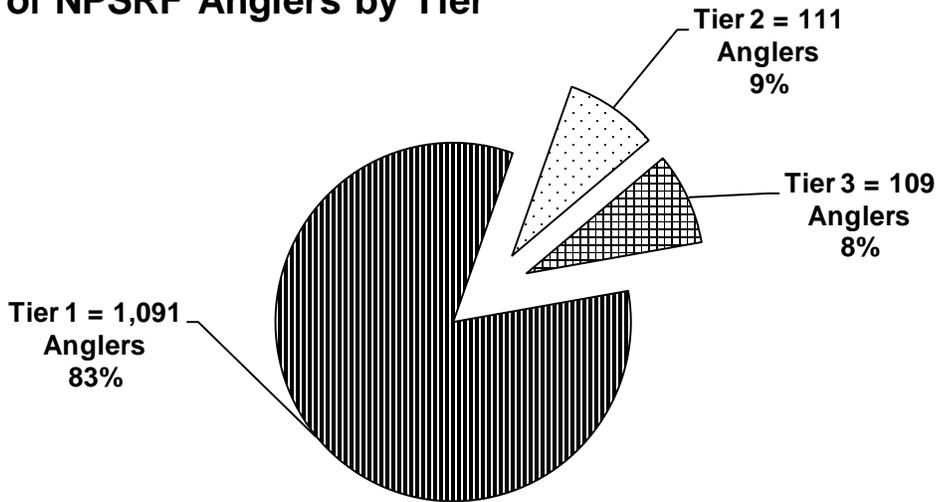


Figure 20. 2010 NPSRF Anglers by tier (returning only) based on total # of fish harvested.

While Tier 1 anglers made up more than 83% of all successful NPSRF participants in 2010, they only harvested 13,740 northern pikeminnow accounting for only 8% of total NPSRF harvest (Figure 21). This translated into an average of 13 fish per Tier 1 angler, per year. Tier 2 anglers harvested 22,429 northern pikeminnow equaling 13% of total 2010 NPSRF harvest and averaging 202 fish per Tier 2 angler, per year. Tier 3 anglers, also known as “highliners”, harvested 138,120 northern pikeminnow equaling 79% of total 2010 NPSRF harvest and averaging 1,267 fish per Tier 3 angler, per year. The percentage of total harvest for Tier 3 anglers increased from 73% in 2009 to 79% in 2010, while the percentage of harvest for Tier 1 and Tier 2 anglers declined.

Percent of NPSRF Harvest by Tier

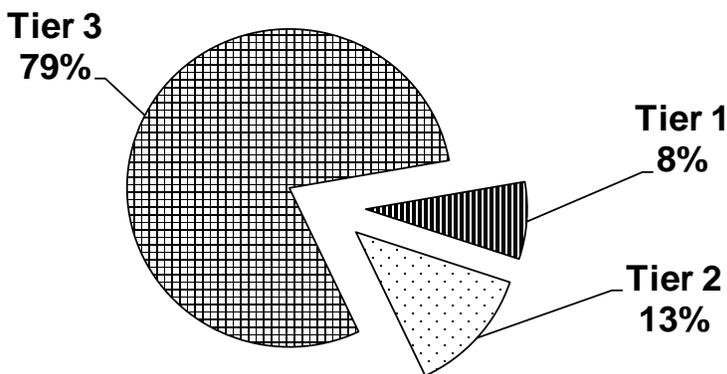


Figure 21. 2010 NPSRF Harvest by Angler Tier (Tier 1 = <100, Tier 2 =101-400, Tier 3 = > 400).

The average NPSRF participant (returning + non-returning anglers) expended more time (effort) pursuing northern pikeminnow during the 2010 season than in 2009 (7.67 vs. 6.50 angling days of effort). When we look at successful anglers only, Tier 1 anglers spent an average of 8 days fishing in the 2010 NPSRF compared to 7 days in 2009 (Figure 22). Tier 2 anglers spent an average of 41 days fishing for northern pikeminnow in 2010, down from 53 in 2009. Tier 3 anglers spent an average of 86 days fishing during the 2010 NPSRF, down from 91 days in 2009. The average number of days spent fishing by anglers at Tier 2 and 3 declined from the previous year, while the average number of days spent fishing by Tier 1 anglers increased by a day. As has been the trend in recent seasons, the NPSRF anglers who harvest the most fish (anglers from Tiers 3 and 2), also expend the most effort.

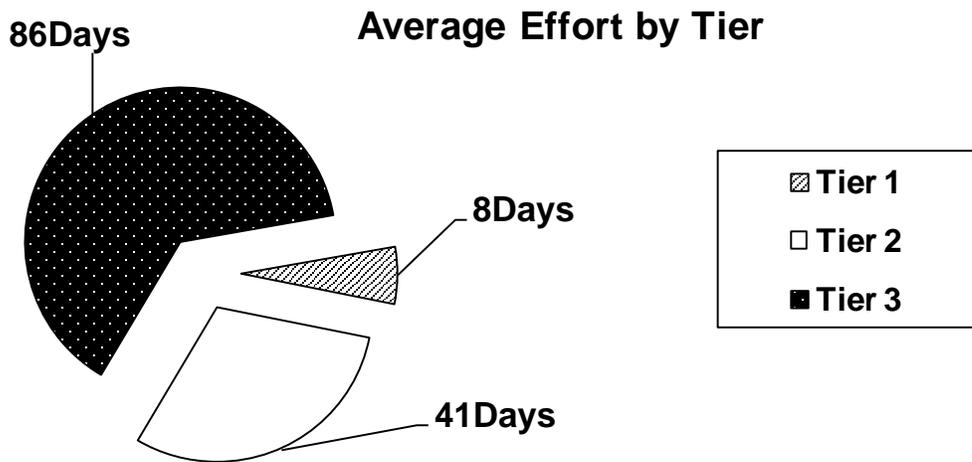


Figure 22. Average Effort of 2010 NPSRF Anglers by Tier (Tier 1 = <100, Tier 2 =101-400, Tier 3 = > 400) .

Overall angler CPUE for the 2010 NPSRF increased from 2009 and the fact that CPUE increased for all anglers at all tier levels (Figure 23) indicates that fishing conditions were more favorable than the previous year. CPUE for anglers at Tier 1 increased from 1.38 in 2009 to 1.64 in 2010. CPUE for Tier 2 anglers increased from 4.04 in 2009 to 4.91 in 2010, and CPUE for Tier 3 anglers jumped from 12.40 in 2009 to 14.77 in 2010.

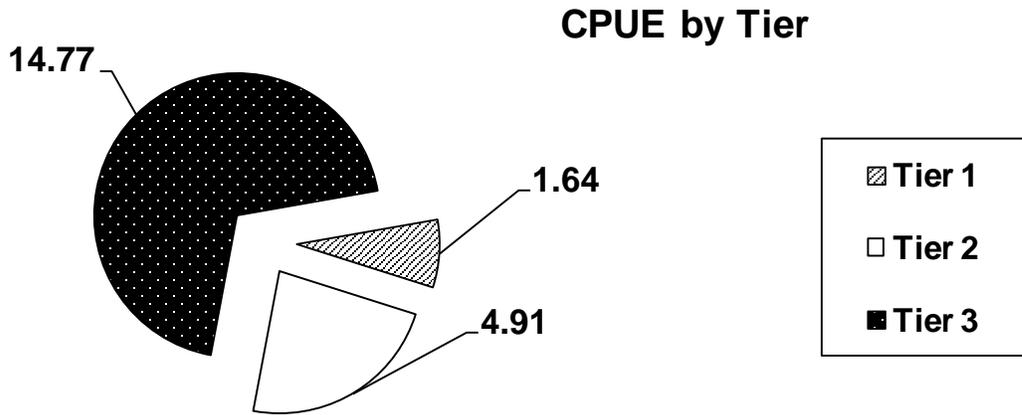


Figure 23. Average CPUE of 2010 NPSRF Anglers by Tier (Tier 1 = <100, Tier 2 =101-400, Tier 3 = > 400).

The top individual angler (based on number of fish caught) for the 2010 NPSRF harvested 9,519 northern pikeminnow and 13 spaghetti tagged northern pikeminnow worth for total earnings of \$81,366 (PSMFC personal communication). The 2010 top angler had a record breaking season catching 3,958 more fish than he had as the top angler in 2009, and over 3,700 more fish than the second place angler. The CPUE for this year’s top angler (80.7 fish per angler day) was nearly double what he had as the top angler in 2009 (41.8 fish per angler day). The top angler for the 2010 season spent 16 fewer days (effort) fishing than he did as the 2009 top angler (134 days) but the effort accounted for a much higher total harvest. By comparison, the top angler (in terms of participation rather than harvest) for the 2010 NPSRF fished 150 days and harvested 1,209 northern pikeminnow.

Tag Recovery

Northern Pikeminnow Tags

Returning anglers harvested 213 northern pikeminnow tagged by ODFW with external spaghetti tags during the 2010 NPSRF compared to 180 spaghetti tags paid in 2009 (Hone et al., 2009). Tag recoveries peaked in week 23, four weeks earlier than peak NPSRF harvest (Figure 24). Of these spaghetti tagged northern pikeminnow, 212 had also been PIT tagged by ODFW as a secondary mark. WDFW technicians also recovered an additional 114 northern pikeminnow which had ODFW PIT tags and wounds and/or fin-clips indicating that the fish had “lost” an ODFW spaghetti tag. The recovered spaghetti and PIT tags, as well as the potential tag loss data was estimated by ODFW to equal a 18.8% exploitation rate for the 2010 NPSRF (ODFW, personal communication).

Spaghetti Tag Recoveries by Week

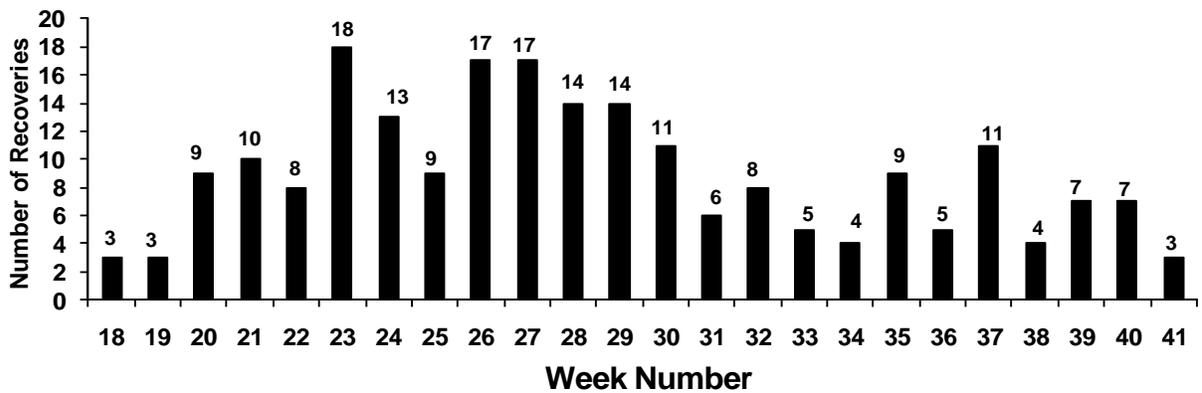


Figure 24. 2010 NPSRF Spaghetti Tag Recoveries by Week.

Ingested Tags

A total of 174,289 northern pikeminnow were individually scanned for the presence of PIT tags. This represents 100% of the total harvest of reward-size fish for the 2010 NPSRF (northern pikeminnow not qualifying for rewards were also scanned whenever possible). We recovered a total of 109 PIT tags from consumed smolts that had been ingested by northern pikeminnow harvested during the 2010 NPSRF, an overall occurrence ratio of 1:1,599. Total ingested tag recoveries in 2010 were higher (9 more) than the previous year, however, with a higher season harvest there ended up being a lower a higher rate of occurrence (1:1,599 in 2010 versus 1:1,420 in 2009) (Hone et al., 2009). PIT tag recoveries of salmonid smolts ingested by northern pikeminnow peaked during the 3rd and 5th weeks of the season (where 19 ingested smolts were recovered) and didn't end until early September (Figure 25).

2010 NPSRF Ingested PIT Tag Recoveries

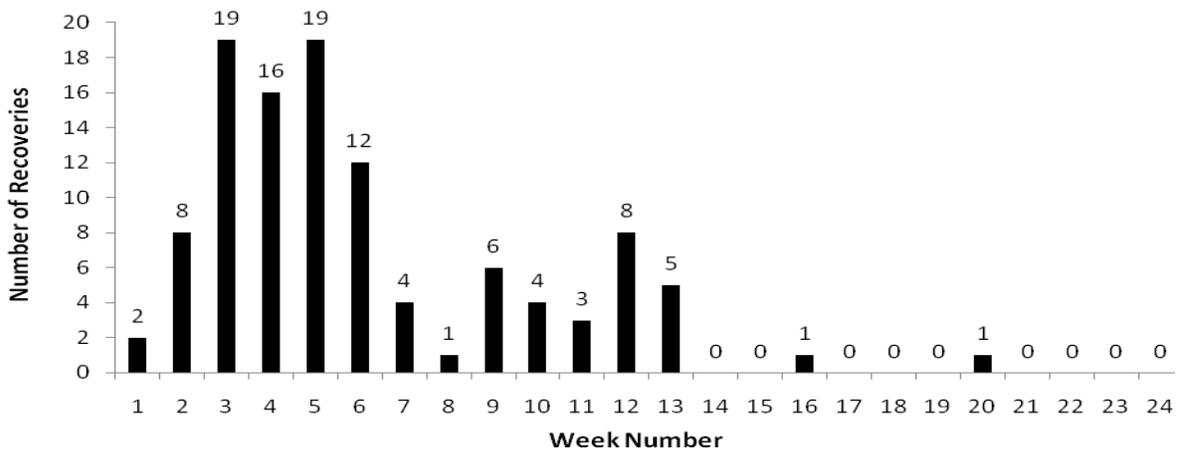


Figure 25. 2010 NPSRF PIT Tag Recoveries by Date.

Pit tag recoveries by fishing location during the 2010 NPSRF showed that northern pikeminnow harvested from Fishing locations 02 (Bonneville Reservoir) ingested the largest number of salmonid smolts containing PIT tags (Figure 26), compared to 25 each from both The Dalles and Little Goose Reservoirs in 2009.

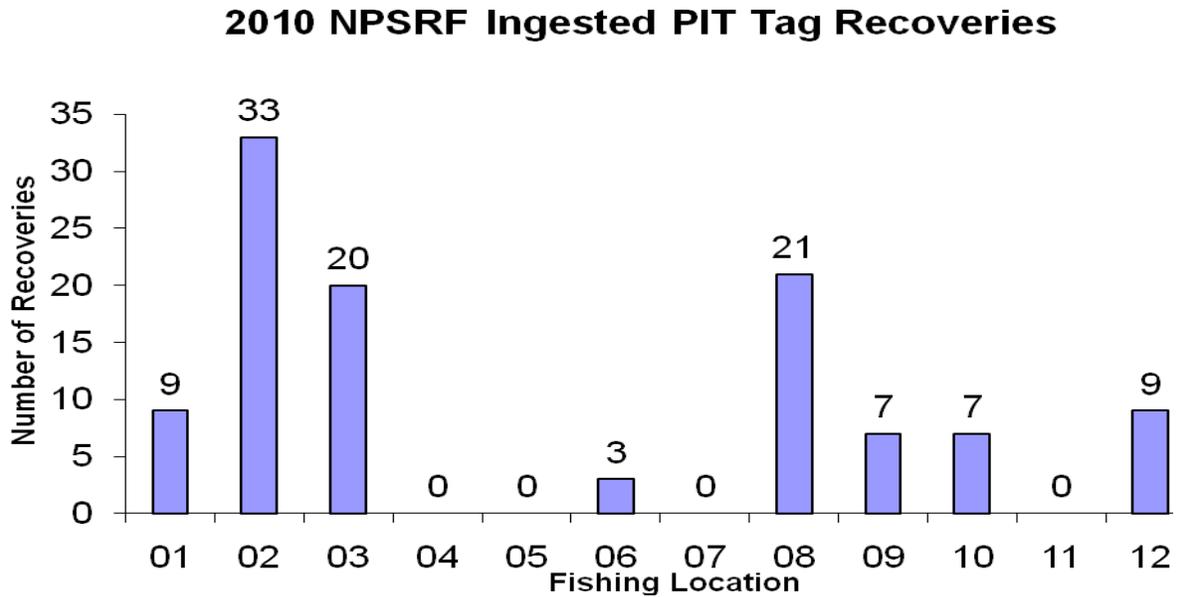


Figure 26. 2010 NPSRF ingested PIT Tag Recoveries by Fishing Location.

*Fishing Location Codes for Columbia River; 1 = Below Bonneville Dam, 2 = Bonneville Reservoir, 3 = The Dalles Reservoir, 4 = John Day Reservoir, 5 = McNary Dam to the mouth of the Snake River, 6 = Mouth of the Snake River to Priest Rapids Dam. Fishing Location Codes for the Snake River; 7 = Mouth of the Snake River to Ice Harbor Dam, 8 = Ice Harbor Reservoir, 9 = Lower Monumental Reservoir, 10 = Little Goose Reservoir, 11 = Lower Granite Dam to the mouth of the Clearwater River, 12 = Mouth of the Clearwater River to Hell’s Canyon Dam.

Species composition of PIT tagged smolts recovered from northern pikeminnow harvested in the 2010 NPSRF was obtained from PTAGIS and indicated that ninety-five (87%) of the 109 ingested PIT tag recoveries were from chinook smolts. The other 14 PIT tags were from 3 sockeye, 3 steelhead and 8 unknown species accounting for the remaining 13% (Figure 27). The majority of chinook PIT tags these were recovered in May along with all the sockeye recoveries and one third of the steelhead recoveries. PTAGIS queries revealed that the PIT tag recoveries from chinook smolts consisted of 34 fall chinook, 32 spring chinook, 16 unknown chinook and 13 summer chinook). PIT tag queries of PTAGIS also indicated that 25 of the 109 recovered PIT tags (23%) were from salmonids of wild origin.

Ingested Salmonids - 2010 NPSRF

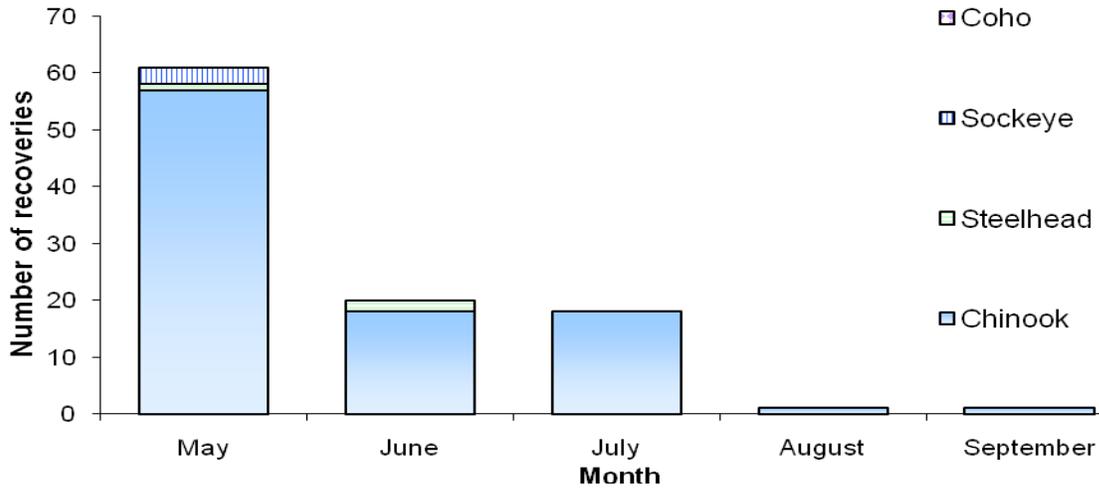


Figure 27. Recoveries of ingested salmonid PIT Tags from the 2010 NPSRF.

Analysis of PIT tag recovery data from the 2010 NPSRF continues to document northern pikeminnow predation on downstream migrating juvenile salmonids. Further data collection and analysis of PIT tag recoveries from juvenile salmonids consumed by northern pikeminnow harvested in the NPSRF may lead to a better understanding of northern pikeminnow predation on salmonid smolts and the factors affecting the vulnerability of smolts to predation while migrating through the Columbia River System.

SUMMARY

The 2010 NPSRF succeeded in reaching the NPMP's 10-20% exploitation goal for the thirteenth consecutive year, achieving an estimated exploitation rate of 18.8%. NPSRF harvest rebounded to very near average 1991-2009 levels and if it were not for two weeks of high runoff in early June (just prior to the spawn) which caused angler harvest to steeply drop, overall harvest in 2010 may well have exceeded 200,000 fish. Angler effort dropped a little from 2009, but angler CPUE returned to the upward trending levels seen prior to 2008 and resulted in an increase in harvest from 2009 to 2010. The 2010 NPSRF saw a decrease in the number of individuals participating in the fishery, but CPUE bounced back upwards from a slump over the previous two years. One of the three new registration stations used during the 2010 NPSRF had exceptional effort and harvest (Beacon Rock), and one showed promise for future years (Portco). Finally, our top angler set a NPSRF record for both individual harvest (9,532 total northern pikeminnow) and payment received (\$81,366 per PSMFC 11/16/2010 Pay Summary).

The NPSRF's top angler for the 2010 season caught 3,958 more fish than he did as the top angler in 2009. The top angler fished fewer days than he did as the top angler last season, but because his CPUE was nearly twice what it was in 2009, he harvested far more northern pikeminnow than he did in 2010. Because an increase in angler CPUE was recorded for the 2010 NPSRF overall and at all tier levels, more favorable fishing conditions were most likely the reason for higher harvest not only for the top angler, but for all 2010 NPSRF anglers.

Detection of PIT tags from juvenile salmonids ingested and retained in the gut of northern pikeminnow continues to yield valuable data about northern pikeminnow predation on juvenile salmonids. We recovered more ingested PIT tags than last year and peak recoveries occurred earlier in the season. Species composition of PIT tag recoveries from ingested juvenile salmonids again showed that they were primarily chinook smolts, mostly of hatchery origin. We also recovered a small number of PIT tags from steelhead, and sockeye smolts this season. Use of PIT tags by ODFW as a secondary mark in spaghetti tagged northern pikeminnow continues to work well and we look forward to the use of these tags producing more accurate estimates of spaghetti tag loss and overall pikeminnow exploitation by the NPMP. PIT tag recoveries also continue to serve as an effective way to identify and document angler fraud from northern pikeminnow tagged outside NPSRF boundaries.

RECOMMENDATIONS

- 1.) Continue use of standardized season dates (May 1st-Sept 30th) for implementation of the 2011 NPSRF in order to enhance promotional opportunities, build angler familiarity, and ultimately to maximize predation reduction.
- 2.) Continue to investigate and develop angler incentives designed to capitalize on, and retain new anglers recruited to the 2011 NPSRF.
 - a) Review angler participation patterns and adjust NPSRF registration station times as needed to facilitate better angler usage, i.e discontinue Arlington station and relocate to Maryhill State Park near Biggs, OR.
 - b) Review NPSRF station times and routes for efficiencies which may allow adding additional stations to provide additional angler opportunities for participation.
 - c) Continue to research feasibility of paying for tag-loss NPM retaining ODFW PIT tags.
 - d) Continue use of coupons for successful anglers.
 - e) Investigate use of internet for advertising NPSRF and/or angler recruitment and education.
- 3.) Review NPSRF Rules of participation as needed, adjusting to the dynamics of the fishery and fishery participants, in order to maintain NPSRF integrity.
- 4.) Retain the option to extend the NPSRF season on a site-specific basis if warranted by high harvest, angler effort, and/or CPUE levels.
- 5.) Continue to scan all northern pikeminnow for PIT tags from ingested juvenile salmonids, from northern pikeminnow tagged by ODFW as part of the biological evaluation of the NPMP, and as a way to deter fraud by identifying fish from outside NPSRF boundaries.
- 6.) Survey at least 20% of non-returning anglers to record non-returning angler catch of all salmonids and to estimate total non-returning angler catch and harvest of all salmonids per NPMP protocol, and to identify any changes in NPSRF catch trends.

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