Current Status of Bull Trout Abundance, Connectivity, and Habitat Conditions in the Walla Walla Basin

2007 Update

Donald R. Anglin
Darren Gallion
Marshall Barrows
Courtney Newlon
Ryan Koch

U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office
Vancouver, Washington

22 February 2008

Introduction

This update is intended to provide preliminary results from work conducted during 2007 regarding migratory bull trout life history, abundance, distribution, and habitat conditions in the Walla Walla Basin, and to provide insight into the effect of physical and hydrologic conditions on bull trout biology and connectivity between local populations and core areas. Work conducted in 2007 will be reported on in more detail in our 2007 Annual Progress Report later this spring. Study area details referred to in this update are shown in Figure 1.

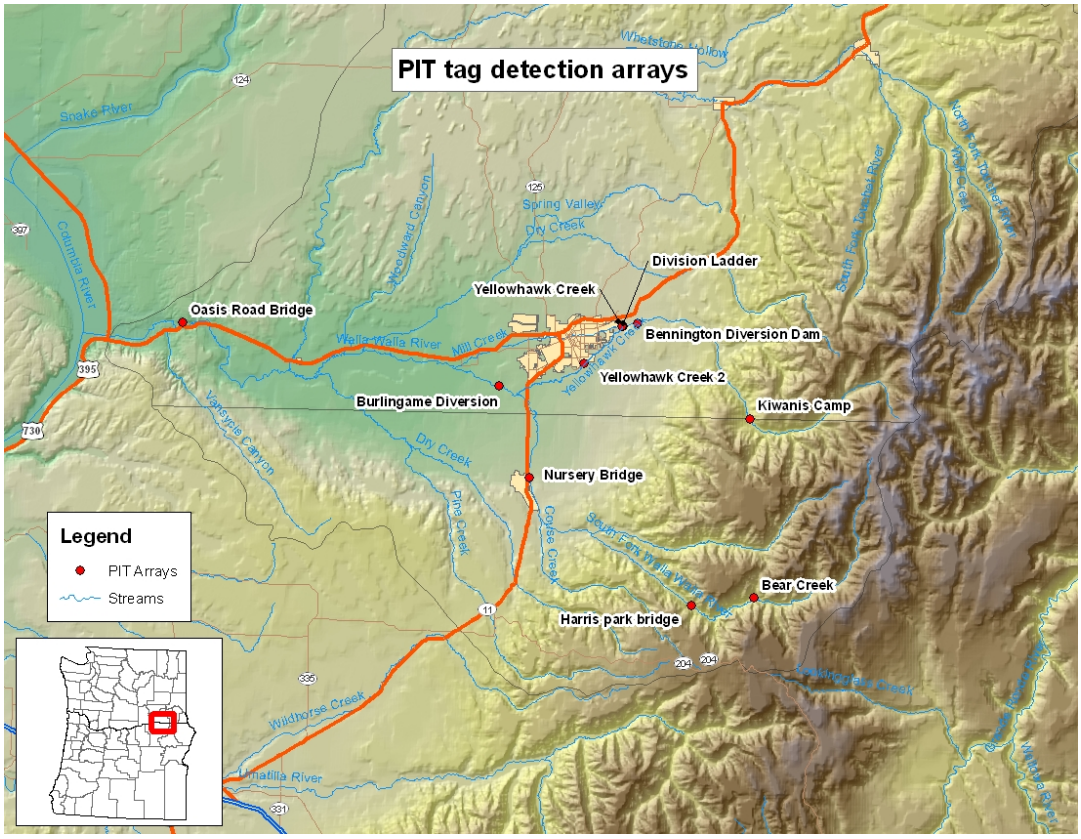


Figure 1. Study area map with locations of PIT detection arrays.

Abundance and Trend

There were 128 migratory bull trout redds identified during 2007 redd surveys conducted in the South Fork Walla Walla River (SFWW) index area. This was similar to the 126 redds identified during 2006 index area surveys, but relatively low when compared to the time series of index area redd counts from 1994 – 2007 (Figure 2). USGS-USU identified a decreasing trend in abundance for the migratory portion of the population in their 2006 annual report (Figure 3). A population is in decline when $\lambda < 1$.

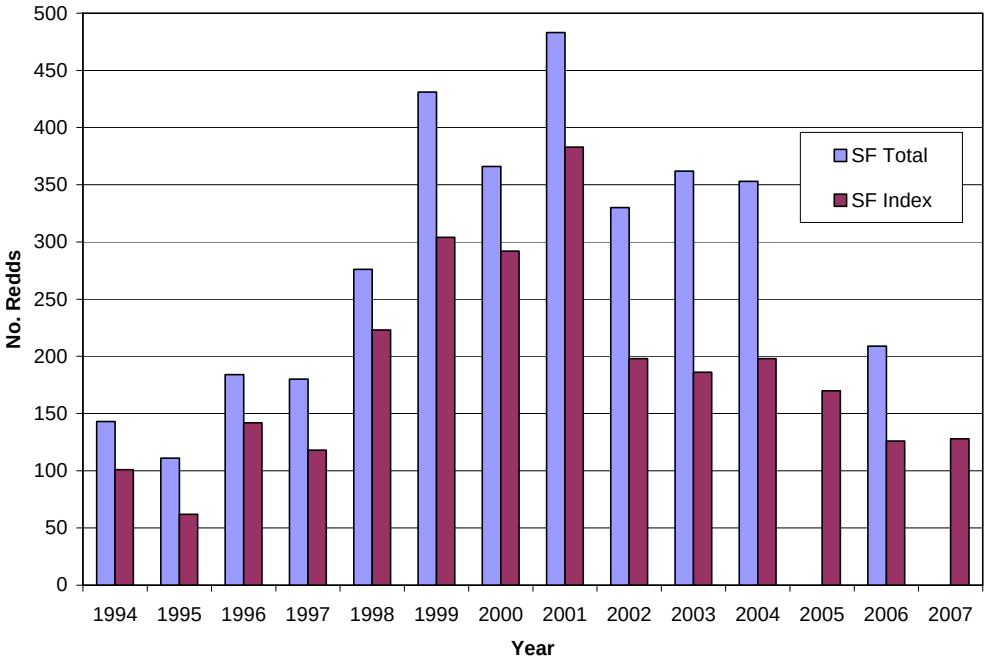


Figure 2. South Fork Walla Walla River bull trout redd survey results, 1994 – 2007.

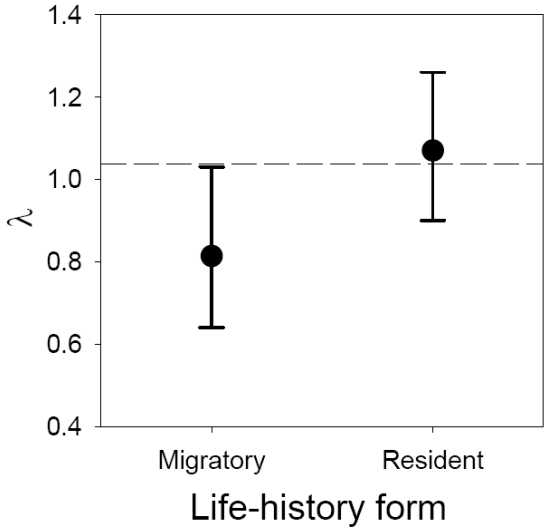


Figure 3. A comparison of trend analyses for resident and migratory bull trout in the SF Walla Walla River using mark - recapture data (2002-2006). Fish were considered migratory if they traveled below Harris County Park.

Biological Connectivity

Fish Sampling

Overall, FWS and CTUIR crews captured 110 bull trout during 2007 in Mill Creek downstream from Bennington Dam and in the mainstem Walla Walla River from the Forks (North Fork and South Fork) downstream to the Burlingame diversion facility (BGM) (Figure 4). Only seven of the total bull trout captured had previously been PIT tagged. Of the seven PIT-tagged fish, one originated from upper Mill Creek, two from the SFWW, one from Nursery Bridge Dam, and three from the Little Walla Walla diversion facility near Cemetery Bridge in Milton-Freewater. Since a relatively small proportion of the population from the SFWW is PIT-tagged, the two recaptures downstream from the Milton-Freewater area represent a larger number of fish from the SFWW that are likely in the same area. The same is true for the Mill Creek population, although a relatively larger proportion of that population is PIT-tagged.

We had observed bull trout in prior years at all of the locations shown in Figure 4 with the exception of the BGM diversion facility, however, sampling near and at that facility was limited. During November and December 2007, 16 subadult and 15 adult bull trout were captured in the BGM diversion canal. During the same time period, no bull trout were captured in the Walla Walla River upstream or downstream from the facility. Although sampling occurred during late October, November, and December, 29 of 31 bull trout were captured on or after November 7, when the streamflow exceeded 25 cfs at the WDOE gage at Pepper Bridge (Figure 5). Increasing streamflows likely eliminated some of the low flow barriers we observed during surveys conducted at summer low flows (approximately 13 cfs at Pepper Bridge; see *Barrier Surveys* below), allowing these fish to disperse downstream.

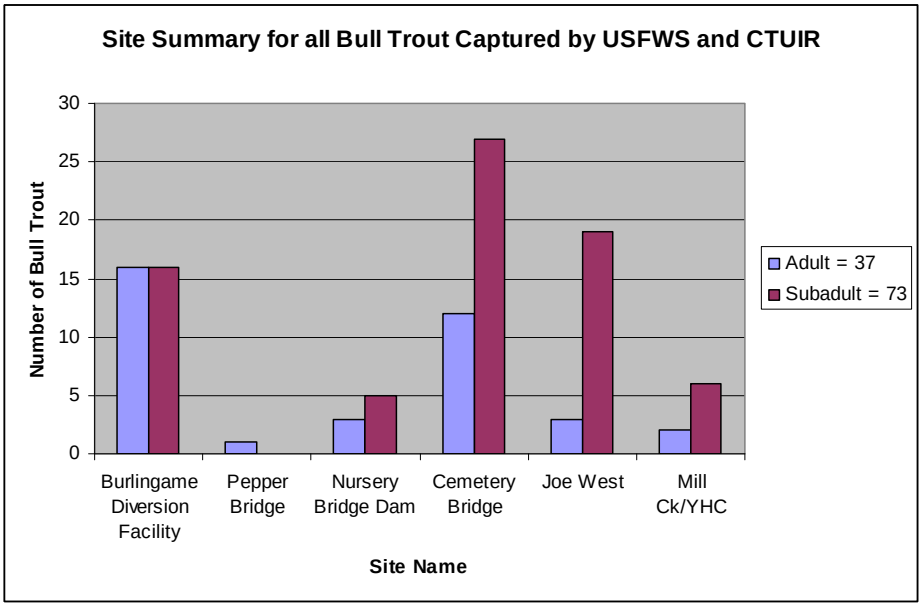


Figure 4. Number of subadult and adult bull trout captured in the lower portions of the Walla Walla River and Mill Creek/Yellowhawk Creek by USFWS and CTUIR during 2007. Numbers reflect all methods of capture including hook and line, fyke net, and screw trap.

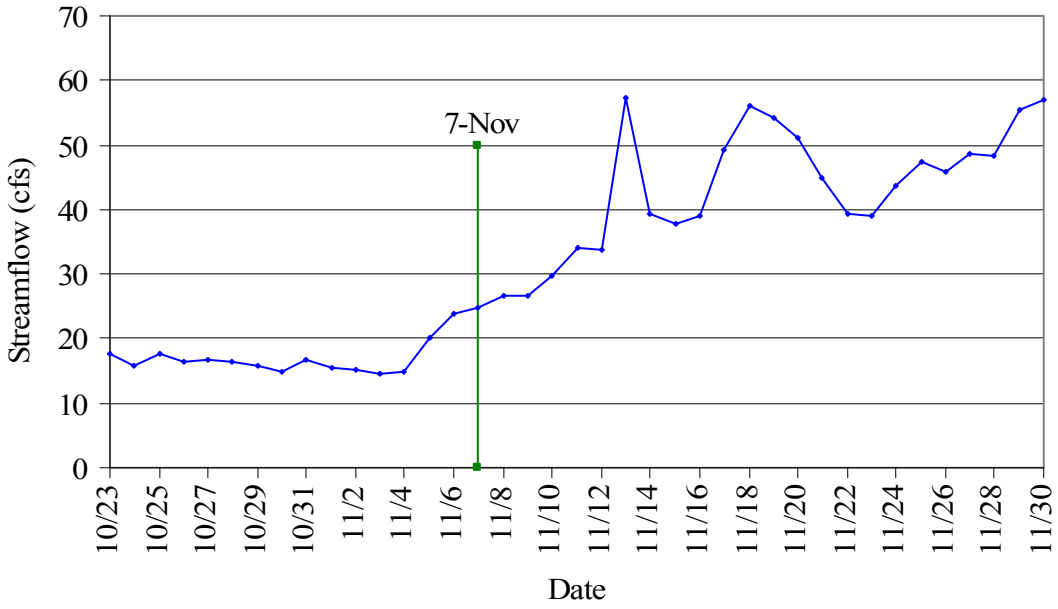


Figure 5. Discharge at the WDOE gage at Pepper Bridge from October 23 – November 30, 2007.

Predation

While conducting fish sampling in 2007, field crews observed evidence of attempted predation. Approximately 25% of the bull trout sampled in downstream areas had scars or wounds, apparently from attempted bird or mammal predation. An example is shown in Figure 6. A possible cause for this relatively high incidence of predation may be exposure of fish by low flow conditions in downstream areas. Considering that we observed a 25% rate of *unsuccessful* predation, if there was a similar rate of *successful* predation, a significant number of bull trout may have been lost during 2007. In addition, since the low flow conditions that occur every year in the mainstem Walla Walla are similar, predation impacts may also be similar, resulting in recurring losses every year. See the Barrier Surveys section below for more discussion.

Figure 6. Bull trout with evidence of attempted predation.

Bennington Dam/Mill Creek Diversion (MCD) PIT Detections

PIT detection data were summarized for MCD and downstream PIT arrays to answer four questions:

- How many PIT-tagged bull trout are passing MCD?
- When are PIT-tagged bull trout passing MCD?
- Where do PIT-tagged bull trout go after they pass MCD?
- What is the subsequent fate of PIT-tagged bull trout passing MCD?

The number of PIT-tagged subadult and adult bull trout passing MCD and their passage timing were compiled from detections during 2007 (Figure 7). Detections were classified as adult or subadult based on the following formula which uses an estimate of the growth rate and size at tagging to calculate the size at time of detection:

Length at tagging + (# days between tagging and detection * .34 mm/day) = Estimated length at detection

Bull trout with an estimated length >300 mm were classified as adults, and bull trout with an estimated length ≤300 mm were classified as subadults. A total of 13 adult bull trout were detected either moving upstream in the spring past MCD to headwater spawning areas, or downstream in the fall to overwintering areas. A total of 48 subadult bull trout dispersed downstream past MCD. Thirty (62%) subadults passed MCD in the spring, with peak movement occurring in June, but also extending into July. Eighteen (38%) subadults passed MCD during the fall, with peak movement during November, and extending into December. Although we could not always determine the direction of travel for these fish, our assumption is that most movement of subadults is in a downstream direction.

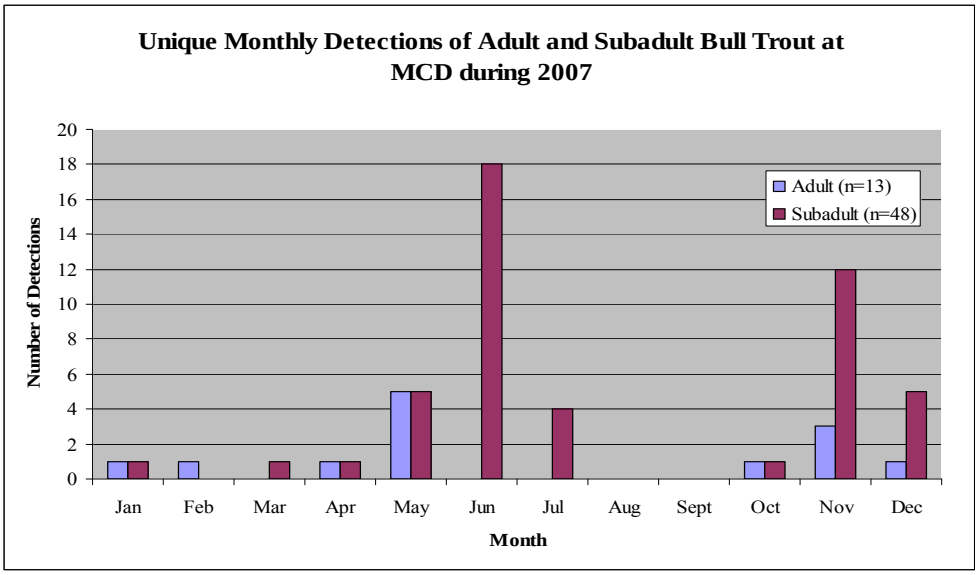


Figure 7. PIT detections of adult (>300) and subadult (≤300) bull trout at MCD during 2007.

A longer term goal of our work is to determine movement patterns of adult and subadult bull trout that originate in the Mill Creek subbasin including their eventual fate. Tag detection histories for PIT-tagged bull trout will be the primary data used to make these determinations. The most useful data will consist of fish with a long time series of detections. A comprehensive analysis to accomplish these goals will be conducted for our annual progress report(s). For this status update, we examined fish that were detected at MCD during 2007. For this analysis, we examined only bull trout that moved *downstream* past MCD (i.e. no upstream-bound adults), and only fish with a single detection at MCD (i.e. no multiple detections of the same fish). Thus, this data set represents a subset (n=40) of the total detections at MCD shown in Figure 7. A summary of detection histories consisting of initial detections at MCD, and subsequent detections at downstream PIT arrays is shown in Table 1.

Table 1. Number of adult and subadult bull trout detected moving downstream at Bennington Dam (MCD) in 2007, and subsequent detections at the Mill Creek Division Ladder, Yellowhawk Creek (YH), and the Burlingame diversion facility (BGM).

	Spring		Fall		Total	
PIT Detection Location	**Subadult**	**Adult**	**Subadult**	**Adult**	**Subadult**	**Adult**
Bennington Dam (MCD)	22	0	14	4	***36***	***4***
Mill Creek Division Ladder	0	0	0	0	***0***	***0***
Yellowhawk Creek (YH)	13	0	5	3	***18***	***3***
Burlingame Dam (BGM)	2	0	2	3	***4***	***3***

There were both subadult and adult bull trout detected at the Division Ladder, YH, and BGM, that were not detected at MCD. These fish were not included in this analysis, or in Table 1 because we wanted to examine the proportions of fish passing MCD, that subsequently passed other downstream locations. It is significant to note however, that both adult and subadult bull trout were detected passing the Division ladder (not detected at MCD). In addition, when water flows over the Division works, it is possible for fish to pass via this route rather than through the ladder where the PIT array is located. These detections are the first empirical data we have collected on fish passing through lower Mill Creek. A more thorough evaluation of fish passage in lower Mill Creek will be conducted in our annual progress report.

Adult bull trout moving downstream past MCD were likely headed to overwintering locations. Three of the four adults detected at MCD were detected at both the Yellowhawk Creek PIT array (YH), and the BGM PIT array. These adults likely overwintered in the mainstem Walla Walla River near or downstream from the BGM diversion facility. The other adult that passed MCD, was not detected at any downstream sites, and could have overwintered in Mill Creek, upstream or downstream from the Division.

Subadult bull trout moving downstream past MCD were likely dispersing to rearing areas. More subadults moved past MCD during the spring than the fall, however, only approximately 50% of those fish were subsequently detected at the YH PIT array. The remaining 50% of the subadults could have occupied rearing locations between MCD and Yellowhawk Creek, spilled over the Division works into lower Mill Creek, or they could have been lost to predation, high water temperatures, low streamflows, or some combination of these factors. It is more likely that fish

dispersing downstream during the spring/early summer time period were lost to mortality due to the highly impacted conditions in this area, although we cannot be sure until detection histories for these individuals are more complete. Subadults that passed MCD during the fall may have encountered lower water temperatures and somewhat higher streamflows, and their fate is less certain. Of the subadults that passed MCD during the spring and fall, and subsequently moved into Yellowhawk Creek past the YH PIT array, approximately 22% (4) were detected at the BGM PIT array. The remaining 78% (14) could have chosen to rear in Yellowhawk Creek, or in the mainstem Walla Walla River near the BGM facility. Conditions in these areas are not as impacted as in Mill Creek, and there is some chance that these fish occupied rearing locations rather than being lost to mortality. Again, future detection histories will help to determine the fate of these subadults.

Streamflows in Mill Creek during a portion of the dispersal period for subadult bull trout (July – mid-November, 2007) varied around approximately 20 cfs (Figure 8). Considering that the flood control channel downstream from MCD is approximately 100 feet wide, depths across the channel at this flow would likely vary around approximately 0.2 feet. Although we have not conducted barrier surveys in this area, our passage criteria for bull trout (adult depth = 0.6 ft, subadult depth = 0.4 ft; Thompson 1972, Reiser and Bjorrn 1979) would not likely be met throughout most of Mill Creek between MCD and Yellowhawk Creek with the exception of the small pools downstream from the stabilization bars. In addition, the lack of cover in this area creates an ideal situation for predators, particularly, avian predators. Great blue herons, great egrets, and osprey are common in this area for most of the year. High summer water temperatures are also likely to be a factor affecting survival of bull trout through this area. Although low flows in Mill Creek affect subadult bull trout throughout the summer and fall, the primary effect on adult bull trout would likely be during the fall in October/November. Adults would be subjected to these same low flow conditions while moving downstream to overwintering areas.

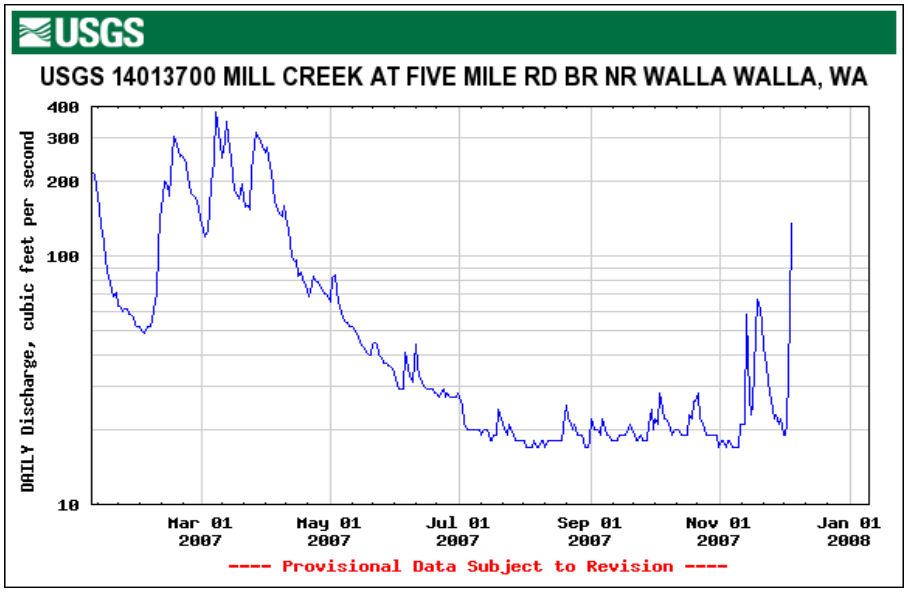


Figure 8. Mill Creek streamflow at USGS gage #14013700 approximately 3 miles upstream from Bennington Dam during 2007.

Burlingame (BGM) PIT Detections

There were 38 individual bull trout with 52 unique monthly detections at BGM during 2007 (Figure 9). Upstream movement of adults to headwater spawning areas occurred during May and downstream migrations to overwintering areas occurred from October through December. One adult was also detected moving downstream in February. There was limited downstream dispersal of subadult bull trout during the summer in June and July, however, more subadult movement occurred from October – December. Of the 38 individual bull trout detected in 2007, 34 were detected in the fall from October – December. These individuals originated from a number of locations around the Mill Creek and Walla Walla subbasins (Table 2).

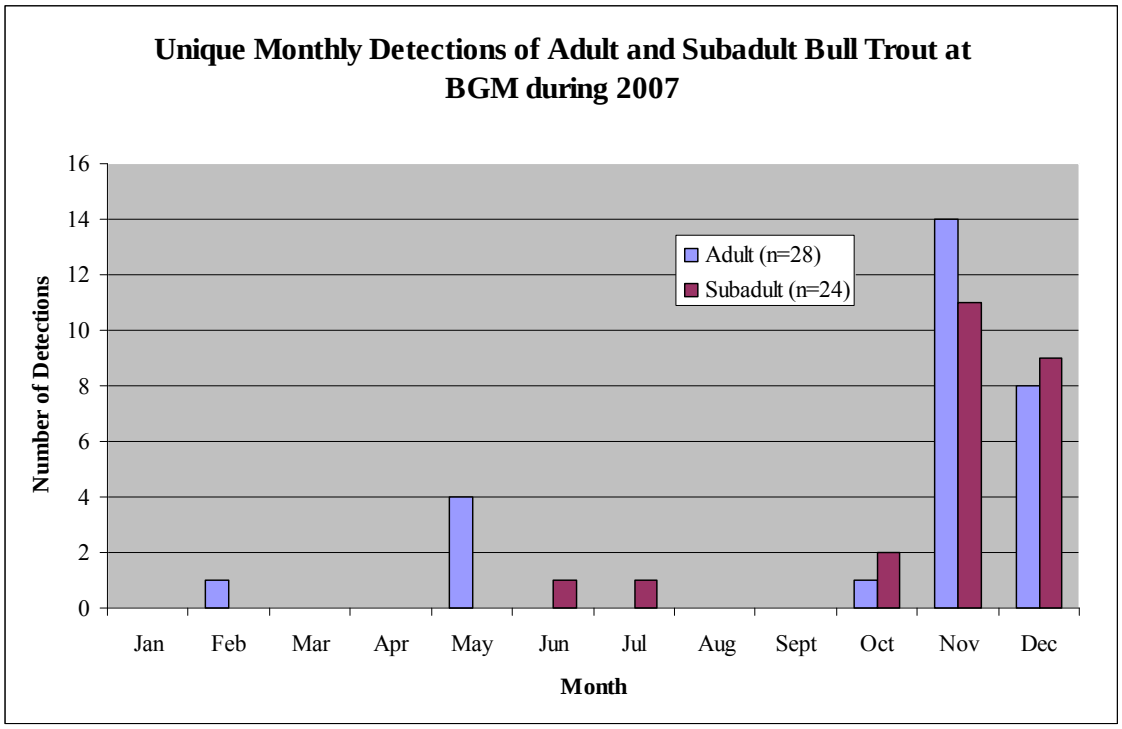


Figure 9. PIT detections of adult (>300) and subadult (≤300) bull trout at BGM during 2007.

Table 2. Initial tagging locations for bull trout detected at the BGM PIT array (n=34) from October through December, 2007.

Initial PIT Tagging Location	Numbers of Bull Trout Detected at BGM
Walla Walla River	
South Fork Walla Walla R.	5
Joe West Bridge	1
Cemetery Bridge	4
Nursery Bridge	5
Burlingame Dam (BGM)	11
Mill Creek	
City Water Intake Dam	4
Bennington Dam (MCD)	3
Yellowhawk Creek (YH)	1
Total	34

Most of our data regarding bull trout occurrence near BGM or movement past BGM are relatively recent. The BGM PIT detection array was not fully functional until February, 2007. Thus, 2007 was the first year that we had the capability to monitor activity this far downriver. The ORB site was in place but not fully functional until 2007. In addition, previous sampling efforts to collect and PIT-tag bull trout in lower river areas including near BGM were unsuccessful. As discussed previously under "Fish Sampling", a relatively large number of bull trout had congregated in the BGM diversion facility during November and December. Sampling conducted during 2007 in the diversion canal itself revealed the presence of these fish. Most of the 31 fish captured had not been previously tagged, and PIT tags were applied to 28 bull trout. Table 2 shows that 11 of these fish were then subsequently detected at BGM. The remainder left the facility. In addition to un-tagged bull trout, bull trout PIT-tagged at other locations in the Walla Walla River and Mill Creek may have been moving past the BGM location previously, however, without detection equipment, it was not possible to document this movement.

As discussed previously, low streamflows during October and early November may have limited movement of bull trout into downstream areas such as near BGM. Our fish sampling work at BGM did not produce any fish until streamflow exceeded 25 cfs at Pepper Bridge, and the most fish were captured (21 of 31 total) after streamflows had exceeded 40 cfs. PIT tag detection data showed a similar pattern. There were only three detections prior to November 7 when streamflows exceeded 25 cfs at Pepper Bridge. And 25 of the 34 detections occurred after streamflows exceeded 40 cfs. Since these increases in streamflow may have been influential in terms of the fish movement we saw, we plan to correlate these flows and dates with the gage in Milton-Freewater to determine the corresponding November flow profile at that location.

Table 3 shows streamflow statistics upstream from BGM at Pepper Bridge, and downstream from BGM at Beet Road. We previously discussed an apparent correlation between the increase in streamflow at Pepper Bridge during early November, and an increase in both our catch of bull trout at BGM and detections of PIT-tagged bull trout at BGM. During the same time period, streamflows downstream from BGM at Beet Road were still at base flow (Figure 10). If there was a similar correlation between streamflow and bull trout passage or abundance downstream from BGM (i.e. as measured at Beet Road), we expect that bull trout movement downstream from this facility may have been impeded during the time period when streamflows were still at base levels.

Table 3. Comparison of daily streamflow (cfs) statistics from the WDOE gages at Pepper Bridge near the WA/OR state line and Beet Road just downstream from BGM for November 2007.

Daily Streamflow (cfs) November 2007	Pepper Bridge	Beet Road
Mean	37.8	20.0
Median	39.1	19.0
Minimum	14.6	17.1
Maximum	57.2	36.8

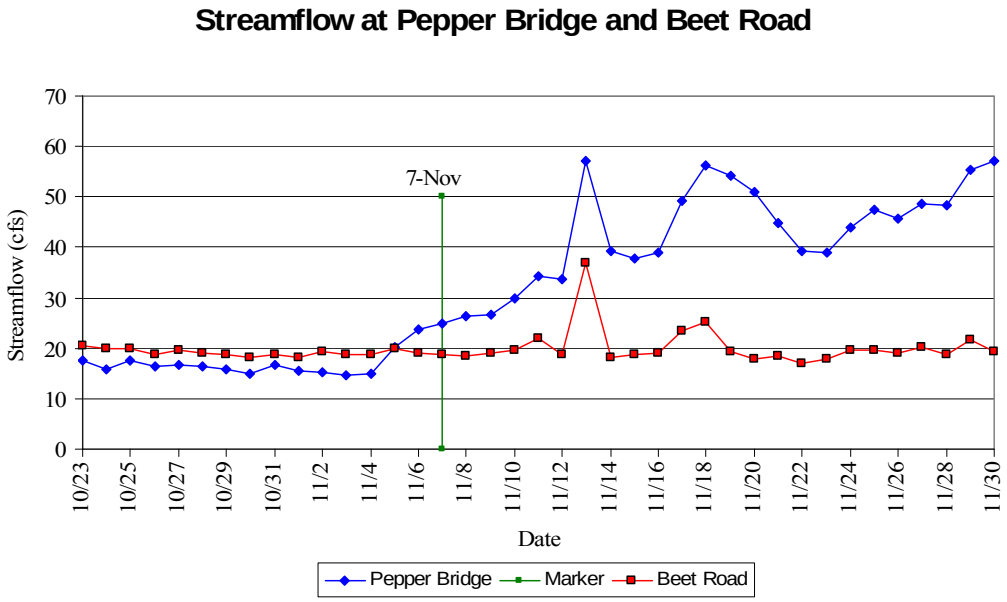


Figure 10. Average daily streamflow at the WDOE gages on the Walla Walla River near Pepper Bridge and near Beet Road.

Considering the relative abundance of bull trout at or near the BGM diversion facility during the fall of 2007, passage conditions should be further examined. Since river flow was still at base levels through mid to late November depending on the location, routes of passage near BGM likely included the irrigation canal bypass or through the fish ladder. The river was completely blocked by the diversion dam (~<1 cm spill), the notch adjacent to the fish ladder was closed, and most of the river flow was diverted down the diversion canal. Bull trout movement through the irrigation canal bypass requires fish to pass over the top of spill boards where water depth can be limited. We have not determined if this condition can delay fish passage. In addition, only one bull trout used the fish ladder to pass the facility when the irrigation canal bypass and fish ladder were in operation. Considering all but one bull trout used the bypass in November when given the two routes of passage, they seem to be avoiding the fish ladder for downstream passage.

PIT detection data for October – December 2007 indicated bull trout took from 0 – >28 days to pass the BGM facility (Table 4). These data also indicated that fish were "wandering" around the facility, with multiple detections at multiple antennae over the course of their presence at BGM. We could not determine from the data, whether these fish were temporarily "residing" at the facility because river flows and passage conditions were inadequate, because they preferred habitat conditions in the facility, or because their migration was being delayed.

Table 4. Number of days for bull trout passage at the Burlingame diversion facility based on first and last PIT detections from October 1 – December 17, 2007.

Days	Number of Bull Trout
0 days	11
1 to 7 days	11
8 to 14 days	2
15 to 21 days	3
22 to 28 days	1
> 28 days	5

Oasis Road Bridge (ORB) PIT Detections

We detected seven bull trout at the ORB PIT array from January 1, 2007 – January 7, 2008. Two bull trout originated in Mill Creek, two in the SF and mainstem Walla Walla River, and three at BGM (Table 5). The two smallest fish at tagging may have experienced enough growth to have recruited into the spawning population, however, if they have not and they are still in the rearing phase of their life history, they represent the migratory component of the Walla Walla Basin population that utilizes the Columbia River to complete rearing to sexual maturity and return as spawners, either to the Walla Walla Basin, or possible to an adjacent basin (e.g. Umatilla). The remaining five bull trout are near adult size, and they may be headed to the Columbia River to overwinter. Future detections for all of these fish will help to determine if they are still rearing or if they have recruited into the spawning population.

Table 5. Bull trout PIT detections at Oasis Road Bridge in 2007-08.

Tag Code	Tagging Location	Length @ Tagging (mm)	Tagging Date	Detection Date
3D9.1BF1FD0CA6	Mill Creek – City Water Intake Dam	203	9-17-06	1-31-07
3D9.1C2C54FE51	MCD	300	10-25-07	11-17-07
3D9.1C2C54FEA1	BGM	285	11-08-07	11-21-07
3D9.1C2C55031B	BGM	315	11-08-07	12-02-07
3D9.1C2C55031F	Nursery Bridge	285	11-07-07	12-18-07
3D9.1C2C550019	BGM	285	11-27-07	12-19-07
3D9.1BF1B29175	SFWW	170	06-07-06	1-07-08

Five of the seven fish detected were PIT-tagged downstream from the SFWW and Mill Creek headwater areas where the majority of bull trout are tagged. Bull trout tagged in these headwater areas include a substantial component of resident fish that will never migrate. Thus, the further downstream, away from headwater areas that fish sampling is conducted, the more likely bull trout will be migratory. In addition, previous observations of rearing bull trout distribution, and overwintering areas for adult bull trout suggest that the migratory portion of the population occurs on several scales, ranging from completing their life cycle in various areas within the basin, to use of the Columbia River to complete their life cycle. Successful monitoring of the portion of the migratory bull trout population that uses the Columbia River will likely require capturing and tagging sufficient numbers of fish in lower Walla Walla River/Mill Creek areas.

Radio-Telemetry Surveys

The goal of our radio telemetry surveys was to describe dispersal patterns of subadult bull trout in Mill Creek and the Walla Walla River at a higher resolution spatial scale than is possible with fixed-site PIT detection arrays. We implemented two seasonal efforts during the spring and fall. The intent of the spring survey was to monitor subadult dispersal as summer arrived, streamflows declined, and water temperatures increased. A total of 10 subadult bull trout were radio-tagged at either Joe West Bridge upstream from Milton-Freewater, or near Cemetery Bridge (LWWD) during the spring of 2007. One subadult moved upstream to a location near the Forks. All of the remaining fish moved downstream, none further than Nursery Bridge. Dispersal of spring/summer migrating subadults may be limited unless movement is initiated early enough to avoid the impending poor river conditions associated with the summer time period.

The intent of our fall radio telemetry survey was to monitor subadult dispersal as streamflows increased and water temperatures cooled. A total of 11 subadult bull trout were radio-tagged in the fall, six near Cemetery Bridge (LWWD) in the Walla Walla River, and five at MCD or YH in Mill Creek. Six of these fish remained in the vicinity of the tagging location through the end of 2007. Two of the remaining five subadults were radio-tagged near Cemetery Bridge, and were last located between Burlingame and Lowden in late January, 2008. Two subadults that were radio-tagged at MCD were last located in the Walla Walla River near the mouth of the Touchet

River in late January. And the fifth subadult that showed substantial movement was radio-tagged in YH and has moved downstream past BGM, although it's current location is unknown.

Based on these preliminary results, it appears that subadult bull trout dispersal or movement into the lower Walla Walla River declines with the onset of summer, possibly in response to the declining hydrograph following the spring freshet, and increasing water temperatures. In contrast, nearly half of the subadult bull trout we radio-tagged in the fall moved downstream out of both Mill Creek and the upper Walla Walla River over distances ranging from 16 – 39 km.

Biological Connectivity – Summary

Results of the data discussed in the *Biological Connectivity* section of this report together with other distribution data have been summarized graphically on page 20 as a periodicity table. An explanation of the table follows on page 21.

Physical Connectivity

Low Flow Barrier Surveys

Surveys were conducted on September 12-13, 2007 in the mainstem Walla Walla River between Cemetery Bridge and Burlingame Dam to determine the location and frequency of fish passage barriers resulting from low streamflows. We used a water depth passage criteria of 0.6 ft cited for steelhead and large resident trout (Thompson 1972, Reiser and Bjorrn 1979) to evaluate passage conditions for adult bull trout. We adjusted this criteria downward to 0.4 ft to evaluate passage conditions for subadult bull trout. We felt these criteria were conservative considering they only provided enough water depth for the physical passage of fish based on body size, but not enough depth to protect bull trout from predators. Streamflows at the time of the surveys were presumably 25-30 cfs from the LWWD, downstream, as measured at the gage downstream from Nursery Bridge Dam. Following the survey, we accessed streamflow data from the WDOE and found that flows on the survey dates ranged from 12.9 to 13.4 cfs at Pepper Bridge.

Based on our passage criteria, we identified a total of 92 low flow passage barriers (e.g. riffles), 84 of which occurred between Tumalum Bridge and Burlingame Dam, a section of the Walla Walla River that is barely 10 km in length (Figure 11). Barriers limiting the movement of adult and subadult migratory bull trout may disrupt their life history, and result in isolation and exposure to increased predation. The potential effects of low flow passage barriers were discussed previously in this update. Examples of low flow passage barriers are shown in Figure 12.

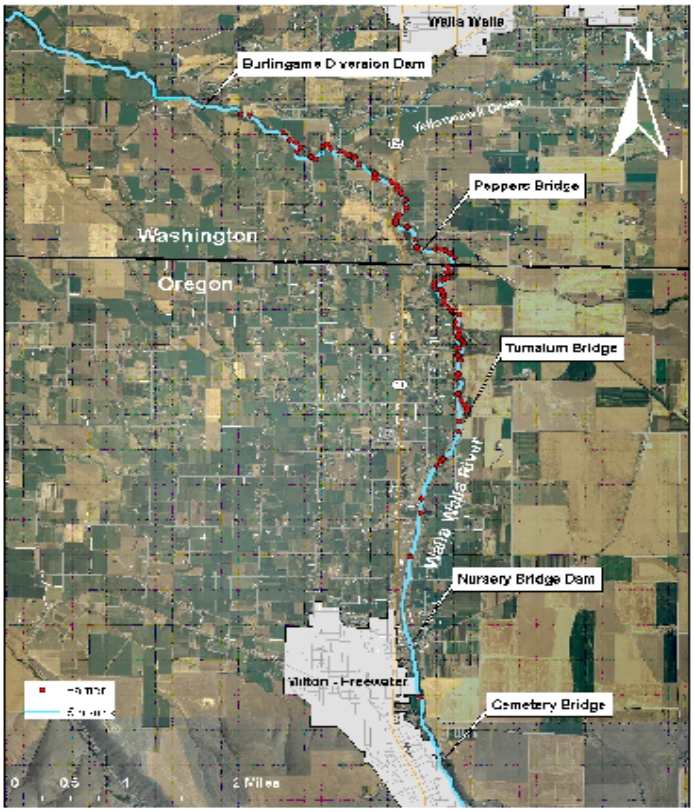


Figure 11. Location of low flow passage barriers identified during surveys conducted on September 12-13, 2007. This figure is included as a full page graphic on page 22.

Figure 12. Photos of barriers located between Little Walla Walla Diversion and Burlingame dam during barrier surveys conducted on September 12-13th, 2007.

Levee Section of the Walla Walla River

The "levee section" of the Walla Walla River refers, primarily to the results of the USACE flood control project that was constructed through the town of Milton-Freewater, OR. The Walla Walla River channel was straightened, levees were built on both sides of the river, and grade control structures were installed to contain and dissipate the energy of the flooding river. Our specific area of focus is the river section from Nursery Bridge Dam (NBD), downstream to Tumalum Bridge. The grade control structure, stilling basin, and fishway at Nursery Bridge were originally designed to alleviate channel degradation and sedimentation issues in this area of the river. However, these problems have continued, and the USACE is considering options to correct or improve the situation. Adult bull trout migrate upstream through the levee section from January through June on their way to the South Fork spawning grounds, and downstream through this area in October and November to overwintering locations. Subadult bull trout disperse downstream through, and/or rear in the levee section during all months of the year with the exception or April. High streamflows may have precluded observations of bull trout during April. It is imperative to maintain upstream and downstream bull trout passage through the Nursery Bridge area, including through or past the Eastside diversion.

Riparian vegetation and habitat in the levee section downstream from NBD has improved in recent years, and has helped to stabilize the river channel, increase channel complexity and cover for fish, increase shade, and reduce water temperatures. Maintenance of this flood control project includes removal of vegetation larger than four inches in diameter. Since the improvements in the riparian zone and it's vegetation are providing significant benefits to the integrity of the stream channel, and likely also to the fish that reside in, and pass through this area, these habitat components should be maintained.

Habitat

We have nearly completed data collection in the SF and mainstem Walla Walla River for development of spawning and rearing habitat suitability models. Development and testing of candidate models is currently underway. USGS-USU has developed a habitat suitability model for rearing bull trout in the SFWW. These models will be available for evaluation of habitat conditions associated with a range of streamflows for bull trout.

Conclusions

1) Abundance and Trend – Redd Surveys.

- The number of redds counted during 2007 index redd surveys in the South Fork Walla Walla River (upper Walla Walla River local population) was similar to index counts conducted during 2006, but were relatively low overall.

- Mark-Recapture studies suggest the migratory portion of this population is in decline. Population estimates for smaller bull trout which may be primarily resident indicate a slight increase from 2002 – 2006.

2) Biological Connectivity – Fish Sampling

- Most of the bull trout captured at the Burlingame Diversion facility during the fall of 2007 were captured following an upstream increase in streamflow to roughly double the base flow conditions (i.e. 13 cfs to 25 cfs).

3) Biological Connectivity – Predation

- Approximately 25% of bull trout captured in 2007 in downstream areas had scars or wounds, apparently from avian or mammalian predators. Based on our observation of this high rate of unsuccessful predation, there are likely substantial numbers of bull trout lost annually to successful predation.

- Low flow conditions are exposing bull trout to the potential for increased predation and mortality.

4) Biological Connectivity – Bennington Dam (MCD) PIT Detections

- Bull trout are migrating past MCD during most months with the largest number of detections in 2007 occurring from May – July, and October – December.

- Sufficient migration flows at MCD must be provided from October through June for adult bull trout and October through July for subadult bull trout. This could be accomplished with either higher streamflows or modifications to the flood control channel between MCD and Yellowhawk Creek.

- Approximately half of the subadult bull trout that dispersed downstream from MCD in 2007 did not pass the next downstream PIT array (YH), and were most likely lost to predation, although tag detection histories are not yet complete. Four of the total 36 subadults that passed MCD proceeded to the mainstem Walla Walla River via Yellowhawk Creek for rearing.

- Three of four adult bull trout that dispersed downstream from MCD overwintered in the Walla Walla River, and one adult was likely lost to predation.

5) Biological Connectivity – Burlingame Diversion Facility (BGM) PIT Detections

- Both adult and subadult bull trout are migrating from upper Mill Creek and the SFWW downstream as far as BGM and beyond. Most of the detections at BGM were during the fall from October through December.

- Most bull trout arrived at BGM following an increase in streamflow to 25 cfs at Pepper Bridge. Many of these fish arrived after the streamflow at Pepper Bridge exceeded 40 cfs. Based on the correlation between streamflow and bull trout movement, migration was likely delayed and fish were likely subjected to predation during fall 2007 flow conditions.

- Streamflow downstream from BGM remained at approximately 20 cfs for the entire month of November, and likely impeded downstream migration.

- Fish passage conditions within the BGM facility (bypass canal, fish ladder) should be further examined to assure conditions are adequate and delays are not occurring.

- PIT detections showed that bull trout spent up to a month at BGM before passing downstream. Investigations should be conducted to determine if migration delay is occurring, or if bull trout prefer to reside at the facility. Structures should be analyzed and potentially modified to ensure ease of bull trout passage.

6) Biological Connectivity – Oasis Road Bridge PIT Detections

- Both adult and subadult bull trout from Mill Creek, SFWW, and the mainstem Walla Walla River were detected moving past ORB into the Columbia River.

- Presumably, adults will overwinter in the Columbia and return to spawn in spring 2008 or 2009, and subadults will rear in the Columbia and return during the spring to recruit into the spawning population when they become sexually mature.

7) Biological Connectivity – Radio Telemetry

- During the spring and summer of 2007, subadult bull trout radio-tagged in the Walla Walla River between the Forks and Cemetery Bridge, generally dispersed downstream, but none further than NBD.

- During the fall of 2007, radio-tagged bull trout from Mill Creek and the Walla Walla River generally dispersed downstream, some as far as rkm 35, near the town of Touchet, WA.

8) Physical Connectivity – Low Flow Barrier Surveys

- Barrier surveys suggest under summer low flow conditions, both adult and subadult passage barriers exist between Nursery Bridge Dam and Burlingame Dam. Most physical barriers were located between Tumalum Bridge and Burlingame.

- Bypassed streamflows of 25 – 30 cfs measured below Nursery Bridge Dam resulted in an average streamflow of 13.1 cfs at Pepper Bridge.

9) Physical Connectivity – Levee Section

- Recently installed structures and proposed structures upstream and downstream of Nursery Bridge Dam should be designed or modified to ensure bull trout passage.
- The riparian vegetation downstream from Nursery Bridge Dam is improving. These improvements should be maintained.

10) Habitat

- Habitat suitability models for bull trout in the Walla Walla River will soon be available, and can be used to evaluate habitat that results from a range of streamflows.

- The physical models required for habitat evaluations will provide the basis for determining flows that would be required to eliminate low flow passage barriers.

BULL TROUT PERIODICITY TABLES FOR THE WALLA WALLA BASIN

Walla Walla River

ADULT BULL TROUT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bear Creek (South Fork Walla Walla)												
Harris Park Bridge (South Fork Walla Walla)												
Nursery Bridge (Milton Freewater)												
Burlingame diversion facility (below state line)												
Oasis Road Bridge (6 miles up from mouth)												

SUBADULT BULL TROUT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bear Creek (South Fork Walla Walla)												
Harris Park Bridge (South Fork Walla Walla)												
Nursery Bridge (Milton Freewater)	V	V	V					S	S			
Burlingame diversion facility (below state line)												
Oasis Road Bridge (6 miles up from mouth)												

Mill Creek

ADULT BULL TROUT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kiwanis Camp Bridge												
Bennington Dam												
Yellowhawk Creek												

SUBADULT BULL TROUT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kiwanis Camp Bridge												
Bennington Dam												
Yellowhawk Creek												

V = Video NBA East ladder observations in 2007

S = Snorkel observations from 2004 and 2005

Bull Trout Periodicity Charts

These periodicity charts for bull trout in the Walla Walla Basin were constructed primarily from PIT tag detections (FWS 2004 - 2008) at the following array locations:

Walla Walla River

Bear Creek on the South Fork Walla Walla River
Harris Park Bridge on the South Fork Walla Walla River
Nursery Bridge Dam on the Walla Walla River in Milton-Freewater, OR
Burlingame Diversion Facility approximately 6.5 km downstream from the WA/OR state line
Oasis Road Bridge approximately 10 km upstream from the mouth of the Walla Walla River

Mill Creek

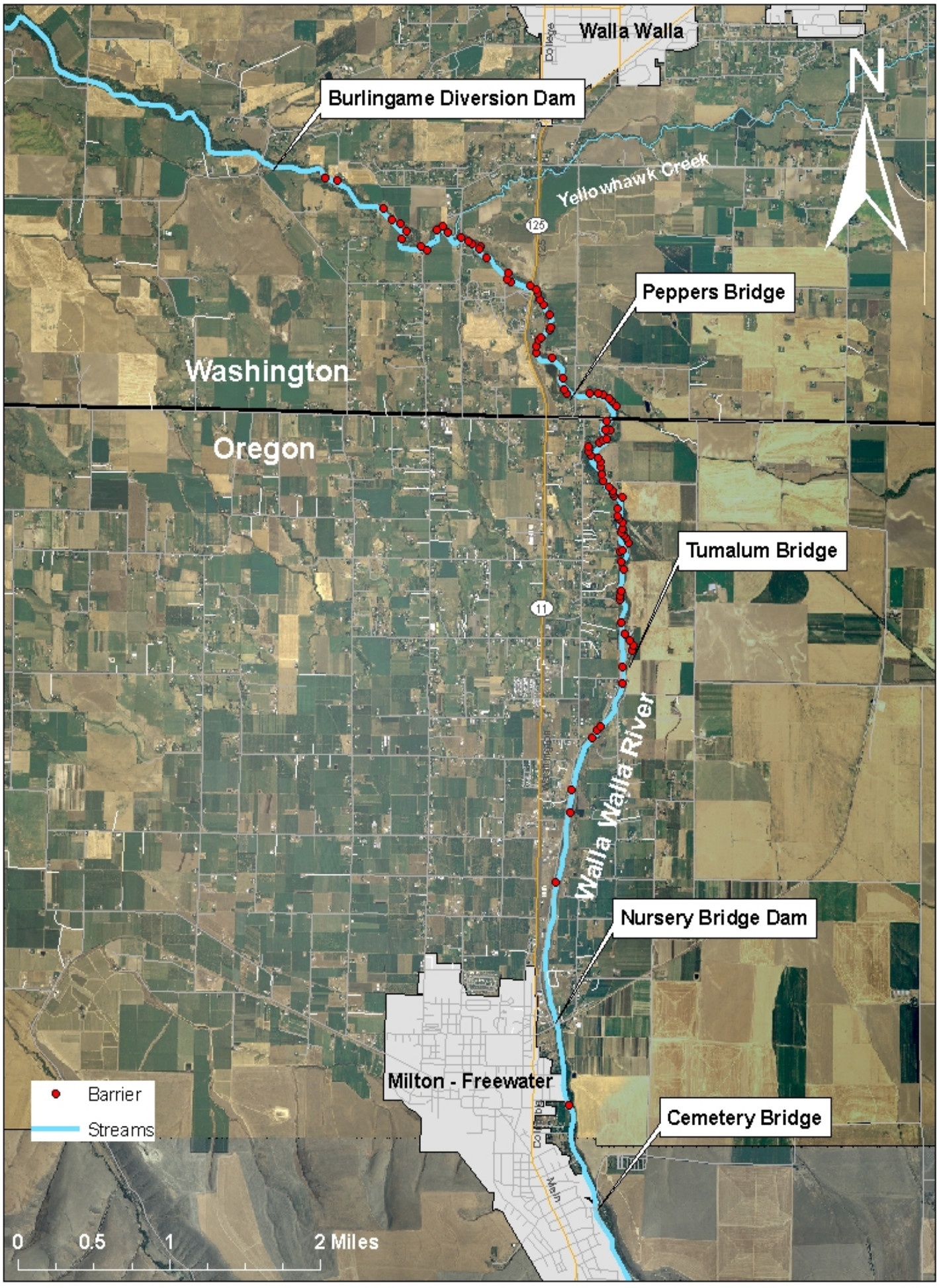
Kiwanis Camp Bridge approximately 16 km upstream from Bennington Dam
Bennington Dam
Yellowhawk Creek

Notes

In addition to PIT tag detections, snorkel survey data (FWS 2004, 2005) collected near Nursery Bridge Dam and video monitoring data from the Nursery Bridge east fish ladder (CTUIR 2007) were used to build the tables.

Cells labeled with "S" indicate snorkel observations and cells labeled with "V" indicate video observations.

Sites are presented from upstream to downstream in order.


Walla Walla
Burlingame Diversion Dam
Yellowhawk Creek
126
Peppers Bridge
Washington
Oregon
Tumalum Bridge
11
Walla Walla River
Nursery Bridge Dam
Milton - Freewater
Cemetery Bridge
Barrier
Streams
0
0.5
1
2 Miles
N