Water Transaction Program
2007-2008 Monitoring and Evaluation Report

Introduction

In 2007 and 2008, the Idaho Water Resource Board (IWRB) completed the following 19 water transactions in the Upper Salmon River Basin:

- Alturas Lake Pivot (2007)
- Alturas Lake Creek non-pivot (2007 – 2011)
- Beaver Creek and Salmon River above Alturas Lake Creek (2005-2014)
- Big Hat Creek (2006-2007, 2008)
- Lower Eighteenmile Creek – Ellsworth (2006-2015)
- Fourth of July Creek (2007, 2008)
- Iron Creek 2007 – Phase II (2007-2026)
- Lower Lemhi (2007, 2008)
- Morgan Creek (2007, 2008)
- Pahsimeroi P-9 Bowles (2008-2027)
- Pahsimeroi P-9 Charlton (2008-2027)
- Pahsimeroi P-9 Dowton (2008-2027)
- Pahsimeroi P-9 Elzinga (208-2027)
- Pole Creek (2006-2010)
- Whitefish Ditch (2008-2026)

These projects increased flows and provided valuable fish habitat and passage on more than 186 river miles in the Upper Salmon River Basin. IWRB also partnered with Trout Unlimited to complete a transaction on Badger Creek in the Little Lost River Basin that reconnected an important tributary for fluvial bull trout.

Alturas Lake Creek – Stanley Basin

IDWR negotiated two transactions with Katie Breckenridge in 2007. The Alturas Lake Creek Pivot 2007 project is a one-year, full-season lease which leaves 5.86 cfs, formerly irrigating 100 acres in Alturas Lake Creek. The Alturas Lake Creek non-pivot 2007 project is a five-year lease which leaves 2.66 cfs, formerly irrigating 45 acres, in the creek. The water is leased from May 1st through October 31st. The leased water restores the natural flow to Alturas Lake Creek, improving fish habitat.

Site visits to Alturas Lake Creek on 8/13/2007 and 8/4/2008 confirmed that the landowner was complying with the terms of the leases. Landsat images also show that the leased water was not being used to irrigate land (Appendix A). A gage in Alturas Lake Creek monitored flow in the river during the irrigation season (Figures 1 and 2).

Idaho Department of Fish and Game (IDFG) conducted Chinook salmon redd aerial surveys in 2007 and 2008 which showed the following:

- 11 redds in the Salmon River within 1.6 miles of the mouth of Alturas Lake Creek in 2007
- 1 redd in Alturas Lake Creek above the original point of diversion in 2008
- 9 redds in Alturas Lake Creek between the original point of diversion and the mouth in 2008

- 20 redds in the Salmon River within 1.6 miles of the mouth of Alturas Lake Creek in 2008

There has been no PHABSIM modeling of Alturas Lake Creek.

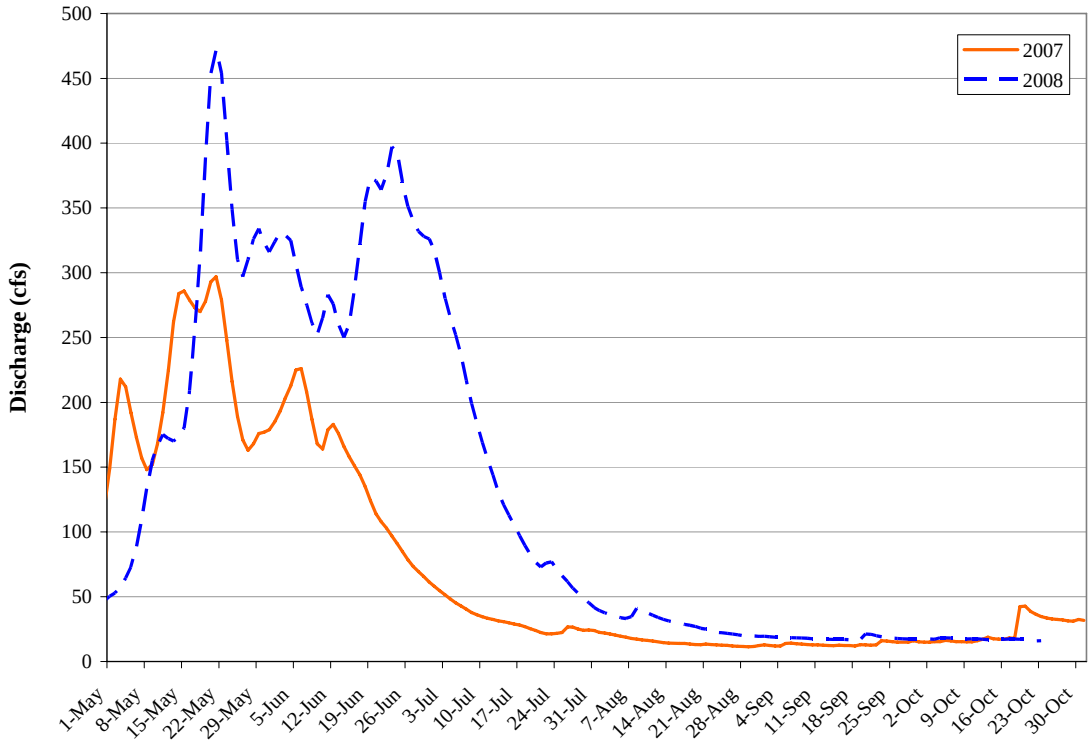


Figure 1. Alturas Lake Creek mean daily flow at Pettit Lane, May 1 to October 31.

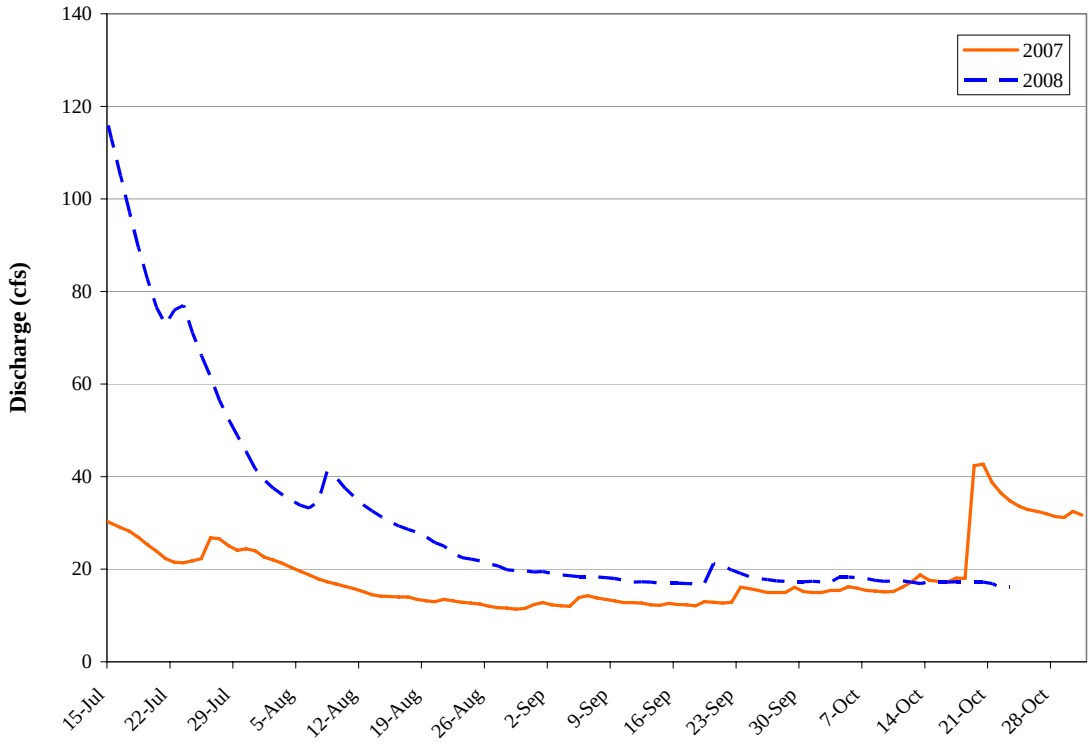


Figure 2. Alturas Lake Creek mean daily flow at Pettit Lane, July 15 to October 31.

Beaver Creek – Stanley Basin

The Beaver Creek project was IDWR's first long-term lease. In the third and fourth year of the ten-year transaction, D.O.T., LLP leased 8.77 cfs, formerly irrigating 241 acres. The water is leased from May 1st through October 15th. When the water is available, this connects approximately 0.8 miles of lower Beaver Creek to the Salmon River, providing cool water and fish access to the upper reaches of Beaver Creek.

Site visits to Beaver Creek on 7/52/2007, 8/1/2007, 8/13/2007, and 9/2/2008 confirmed that the landowner was complying with the terms of the lease. Landsat images also show that the leased water was not being used to irrigate land (Appendix A). A gage in Beaver Creek monitored flow in the river during the irrigation season (Figures 3 and 4). In 2007, the leased water provided a reconnect to Beaver Creek through early July. After early July, the flow in Beaver Creek dropped below levels that would provide reconnection. Although the flows did not provide fish passage, they most likely provided groundwater recharge and cooler sub-surface flows to the upper Salmon River. In 2008, a base flow of about 5 cfs provided a reconnection for juvenile salmonids throughout the irrigation season.

Idaho Department of Fish and Game (IDFG) conducted Chinook salmon redd aerial surveys in 2007 and 2008 which showed the following:

- 1 redd in the Salmon River within 8.2 miles of the mouth of Beaver Creek in 2007
- 2 redds in the Salmon River above Beaver Creek in 2008
- 13 redds in the Salmon River within 8.2 miles of the mouth of Beaver Creek in 2008

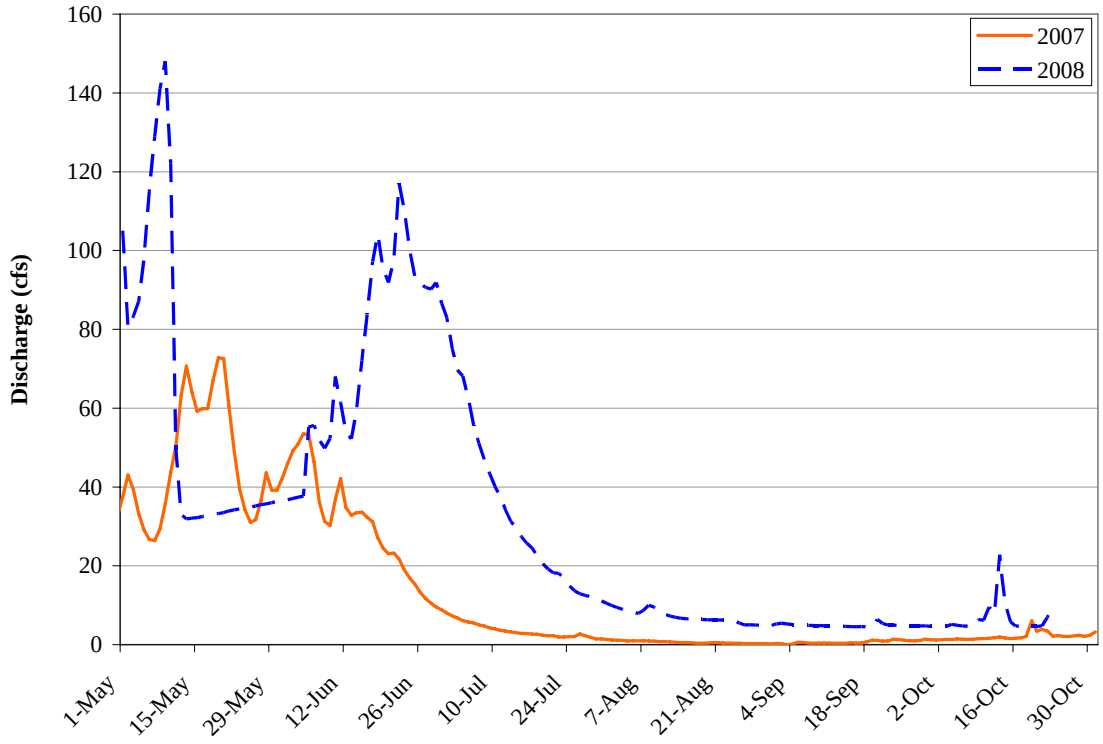


Figure 3. Beaver Creek mean daily flow at Highway 93, May 1 to October 31.

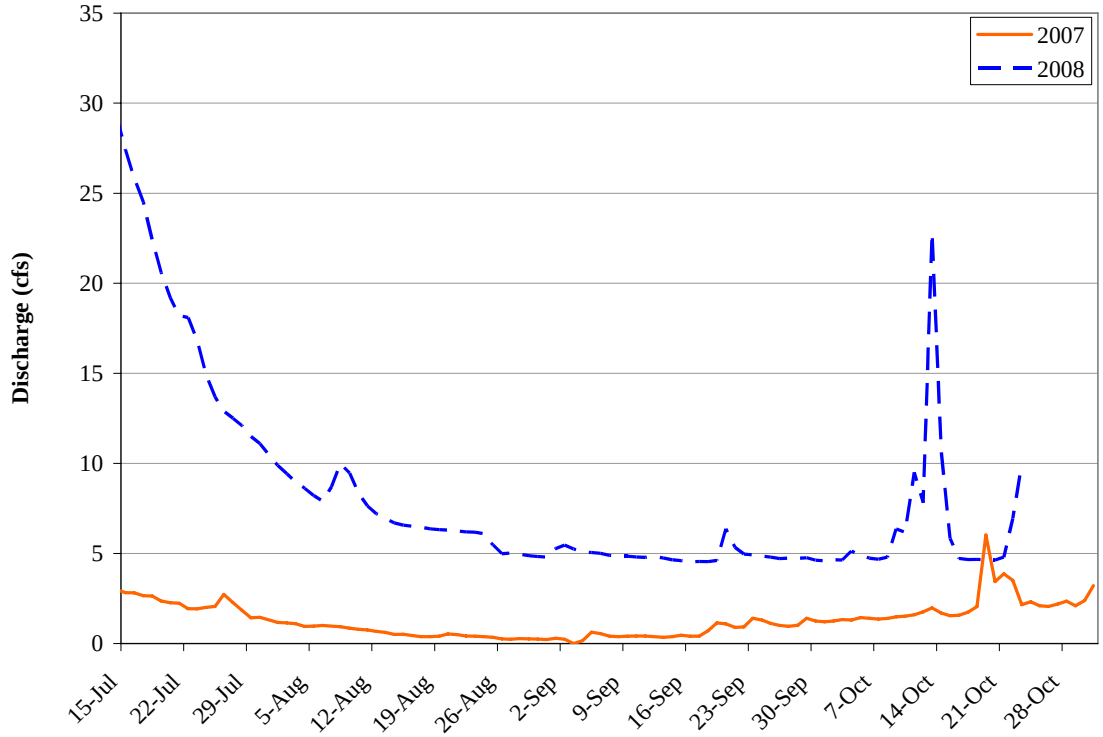


Figure 4. Beaver Creek mean daily flow at Highway 93, July 15 to October 31.

A riparian vegetation survey conducted in 2005 and 2008 showed increases in riparian shrubs, mainly willow and box elder, at both survey locations. Riparian shrubs develop root masses that can stabilize stream banks against cutting action and provide which can lower stream temperatures and provide protective cover from predators. Figures 5 and 6 show changes in vegetative composition at 2 sites in the Beaver Creek channel.

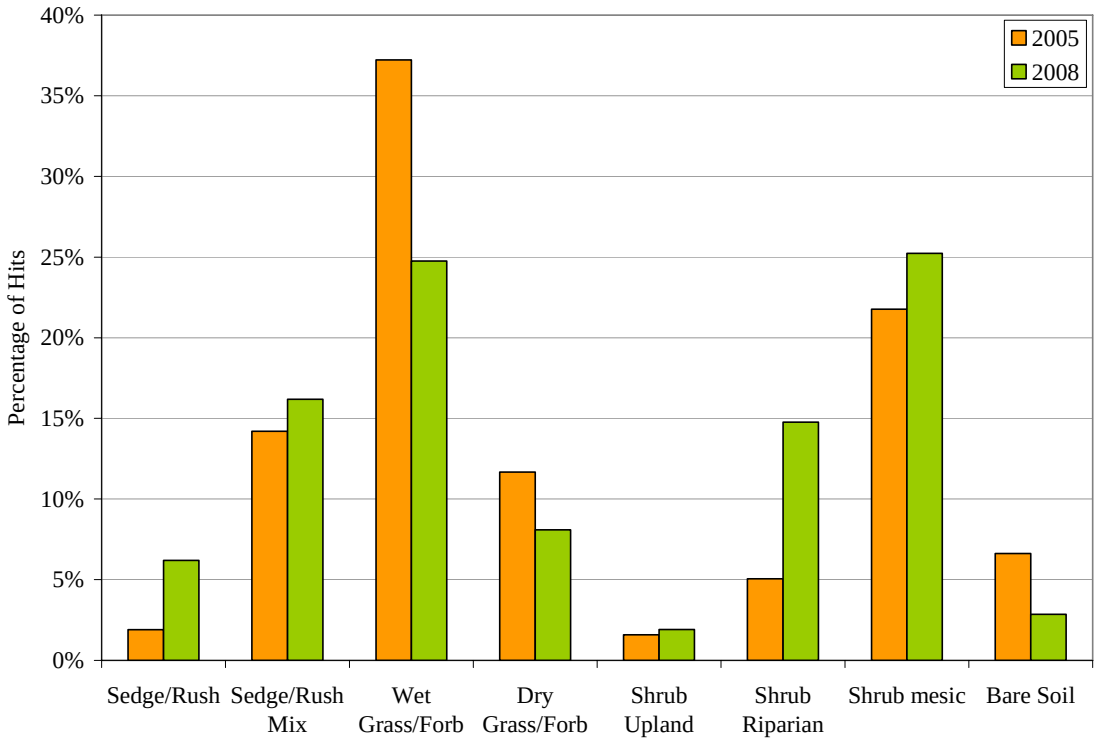


Figure 5. Beaver Creek below Highway 93 green-line vegetative survey results showing the change in riparian vegetation composition between 2005 and 2008.

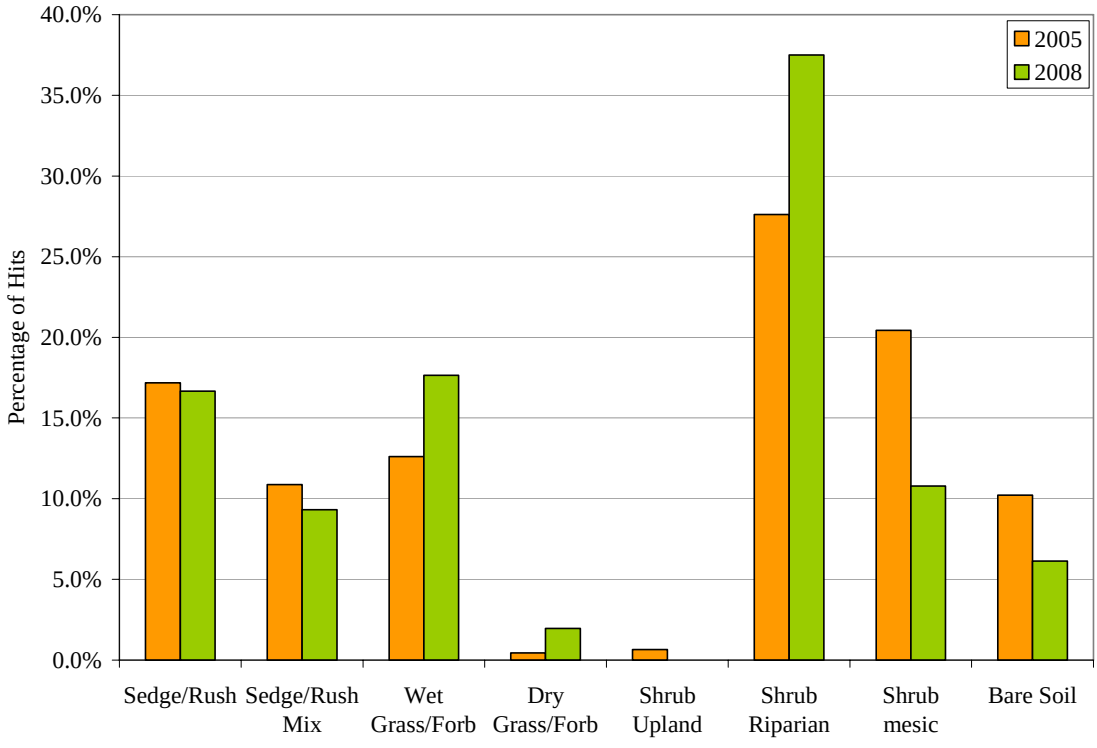


Figure 6. Beaver Creek above Highway 93 green-line vegetative survey results showing the change in riparian vegetation composition between 2005 and 2008.

Physical Habitat Simulation (PHABSIM) results from a study on Beaver Creek (Maret et al. 2005) were used to develop habitat availability with and without the 8.77 cfs of leased water. Figures 7-12 represent the percentage of usable area for each species of concern. Juvenile habitat is not included due to limitations of the PHABSIM model.

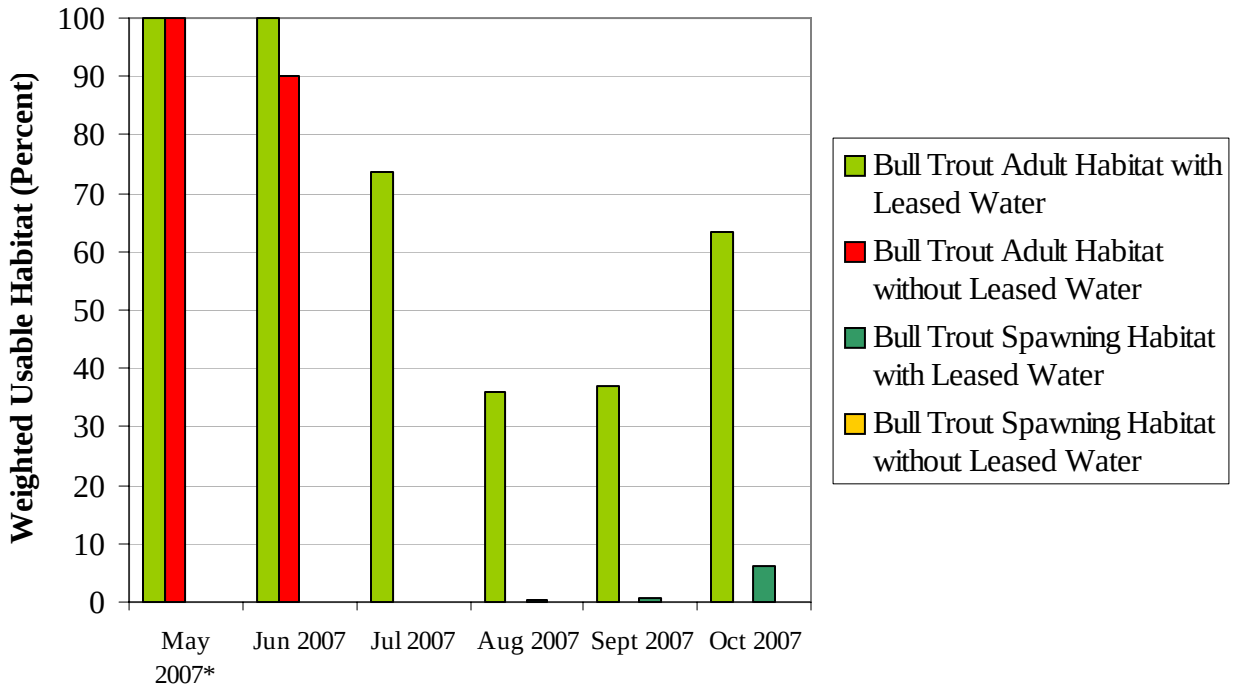


Figure 7. Percent usable habitat for adult and spawning bull trout at mean monthly flows in 2007, including and excluding the leased 8.77 cfs. * Flows in May were beyond the modeled range.

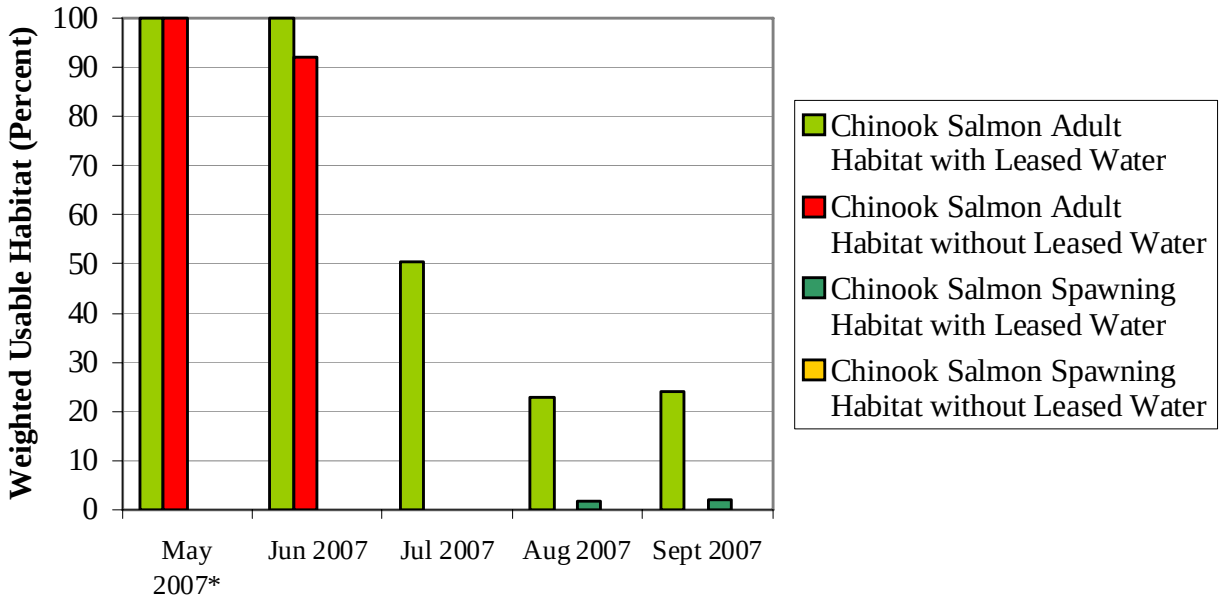


Figure 8. Percent usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2007, including and excluding the leased 8.77 cfs. * Flows in May were beyond the modeled range.

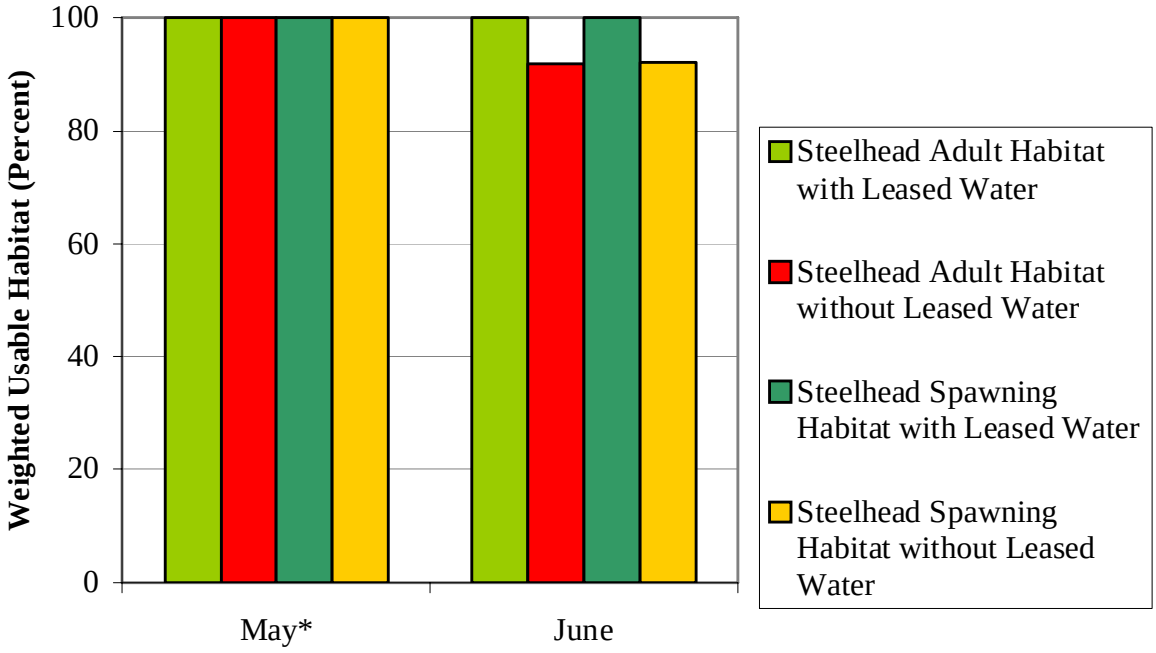


Figure 9. Percent usable habitat for adult and spawning steelhead at mean monthly flows in 2007, including and excluding the leased 8.77 cfs. * Flows in May were beyond the modeled range.

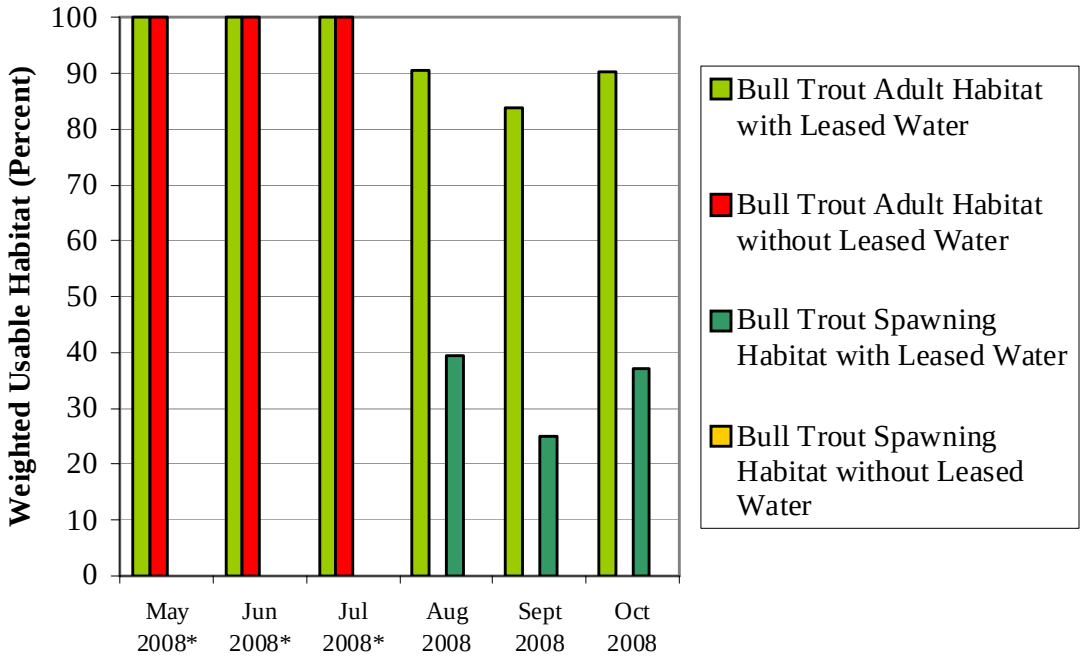


Figure 10. Percent usable habitat for adult and spawning bull trout at mean monthly flows in 2008, including and excluding the leased 8.77 cfs. * Flows in May, June, and July were beyond the modeled range.

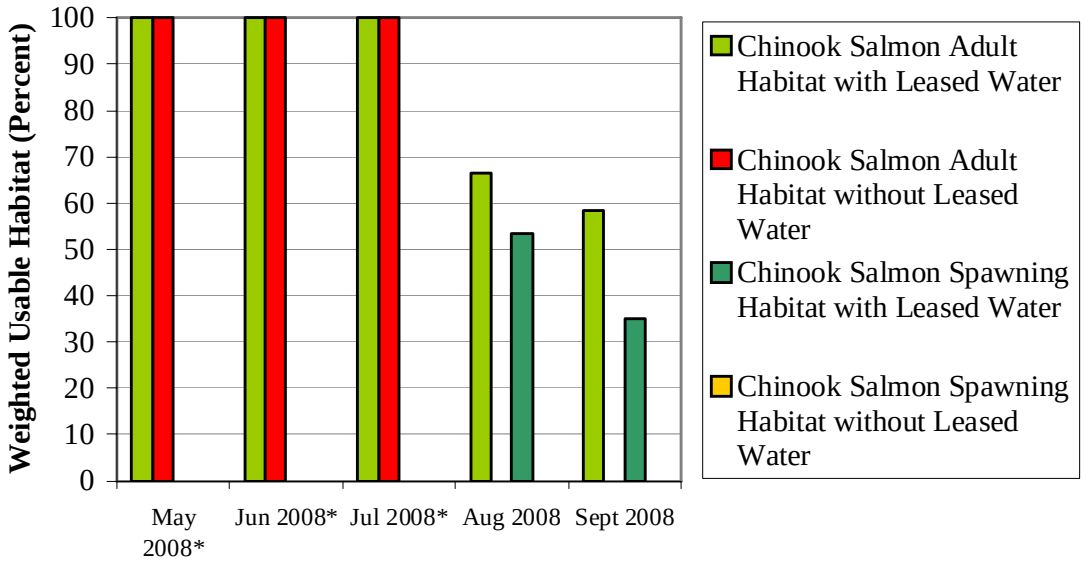


Figure 11. Percent usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2008, including and excluding the leased 8.77 cfs. * Flows in May, June, and July were beyond the modeled range.

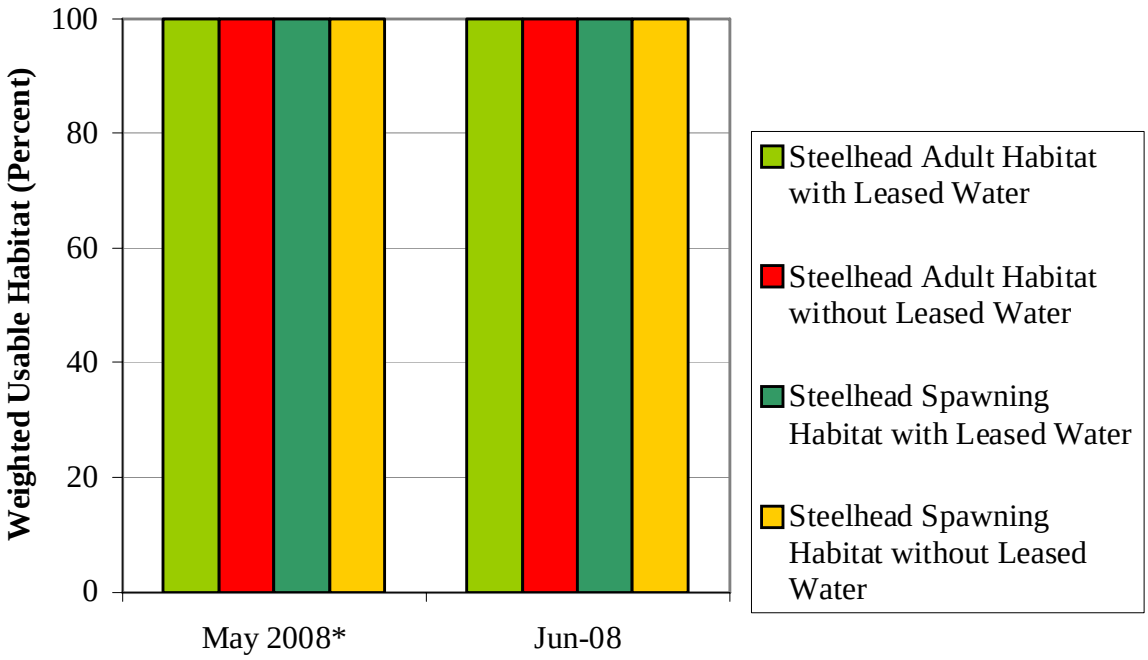


Figure 12. Percent usable habitat for adult and spawning steelhead at mean monthly flows in 2008, including and excluding the leased 8.77 cfs. * Flows in May and June were beyond the modeled range.

Fourth of July Creek – Stanley Basin

The Fourth of July Creek transactions consisted of the second year of a 2-year lease in 2007, and a one-year donated lease in 2008. The Vanderbilts leased 2.9 cfs into the Water Supply Bank which formerly irrigated 43.1 acres. The water was leased from May 1 to Oct. 31. Approximately 2.0 miles of lower Fourth of July Creek were reconnected to the Salmon River. This provided fish access to the upper reaches.

Site visits to Fourth of July Creek on 6/15/2007, 7/26/2007, 8/13/2007, 9/11/2007 and 8/5/2008 confirmed that the landowners were complying with the terms of the lease. Landsat images also show that the leased water was not being used to irrigate land (Appendix A). A gage in Fourth of July Creek monitored flow in the river during the irrigation season (Figures 13 and 14). The leased water provided a reconnect to the Salmon River throughout most of the irrigation season for juvenile salmon, steelhead and bull trout.

Idaho Department of Fish and Game (IDFG) conducted Chinook salmon redd aerial surveys in 2007 and 2008 which showed 35 and 54 redds, respectively, in the reach of the Salmon River that extends from 0.52 miles upstream of the mouth of Fourth of July Creek to 10.9 miles downstream of the mouth.

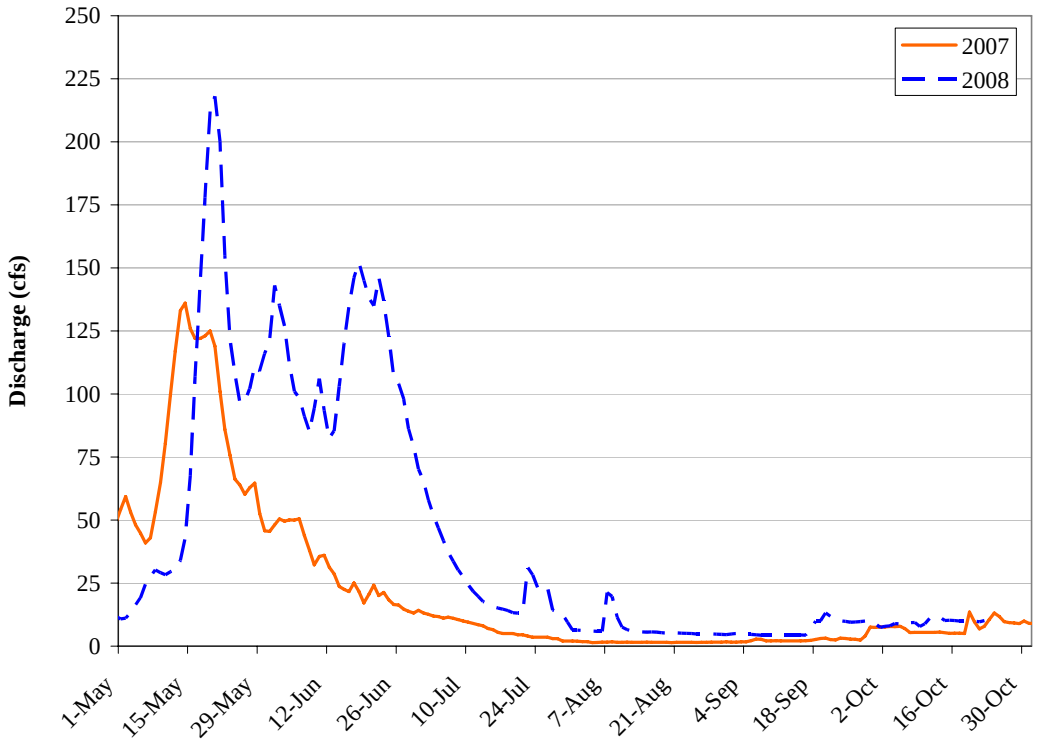


Figure 13. Fourth of July Creek mean daily flow at Highway 93, May 1 to October 31.

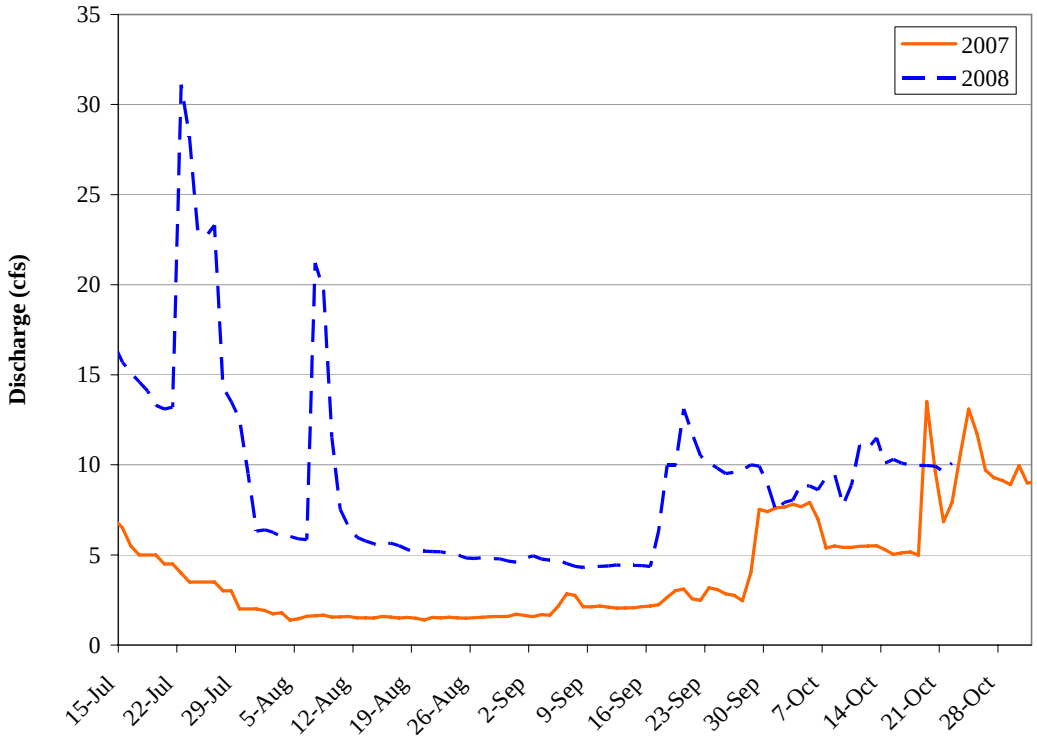


Figure 14. Fourth of July Creek mean daily flow at Highway 93, July 15 to October 31.

Physical Habitat Simulation (PHABSIM) results from a study on Fourth of July Creek (Maret et al. 2005) were used to develop habitat availability with and without the 2.9 cfs of leased water. Figures 15-20 represent the percentage of usable area for each species of concern. Juvenile habitat is not included due to limitations of the PHABSIM model.

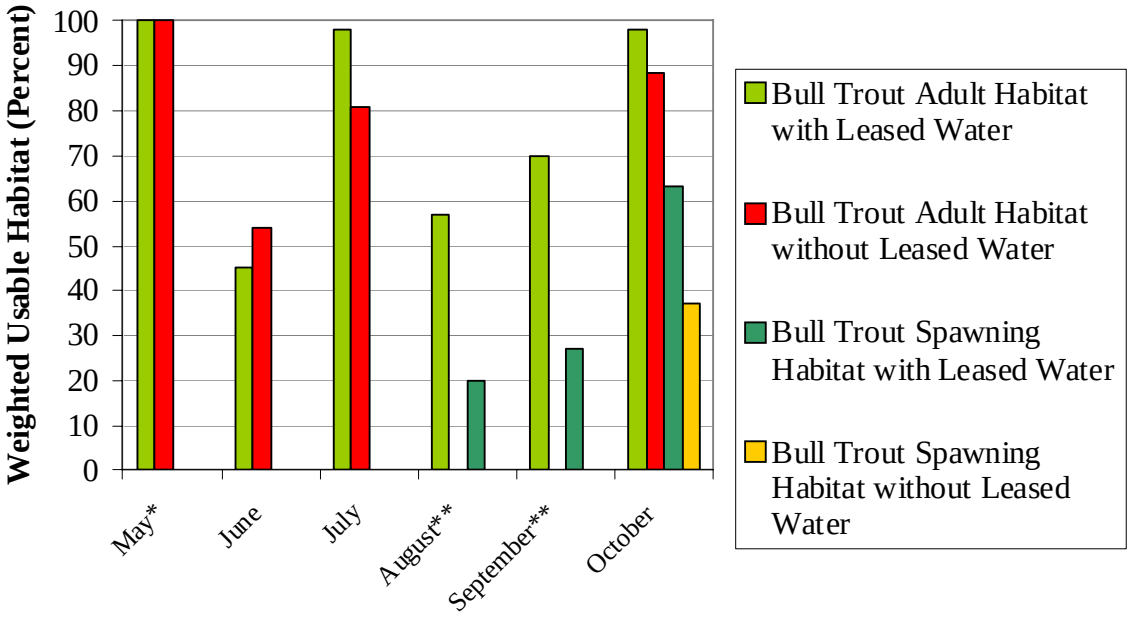


Figure 15. Percent weighted usable habitat for adult and spawning bull trout at mean monthly flows in 2007, including and excluding the leased 2.9 cfs. * Flows in May were beyond the modeled range. ** Flows in August and September were below the modeled range, values were determined by extending modeled curve.

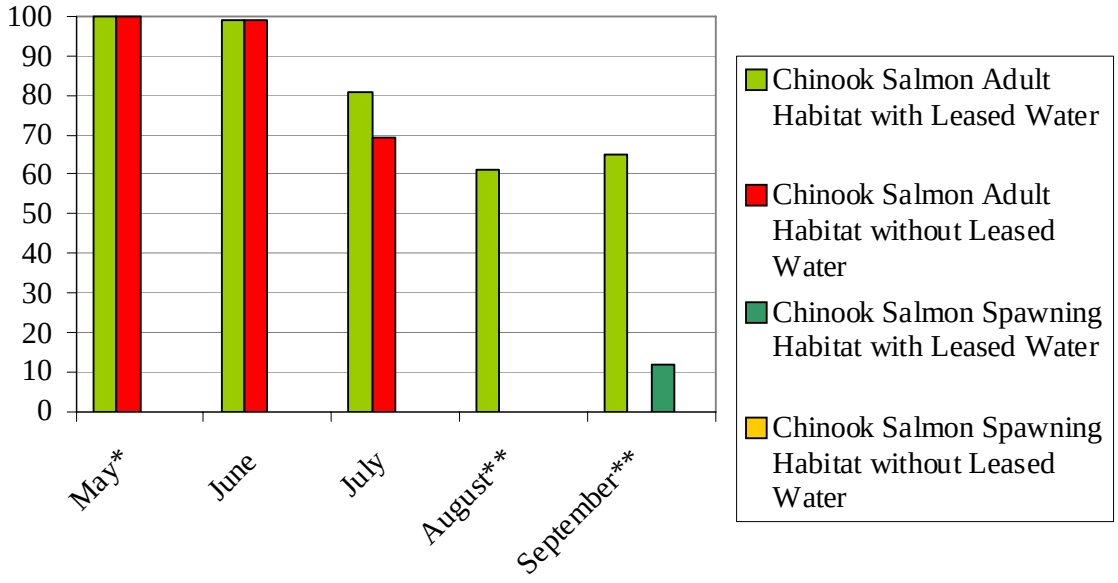


Figure 16. Percent weighted usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2007, including and excluding the leased 2.9 cfs. * Flows in May were beyond the modeled range. ** Flows in August and September were below the modeled range, values were determined by extending modeled curve.

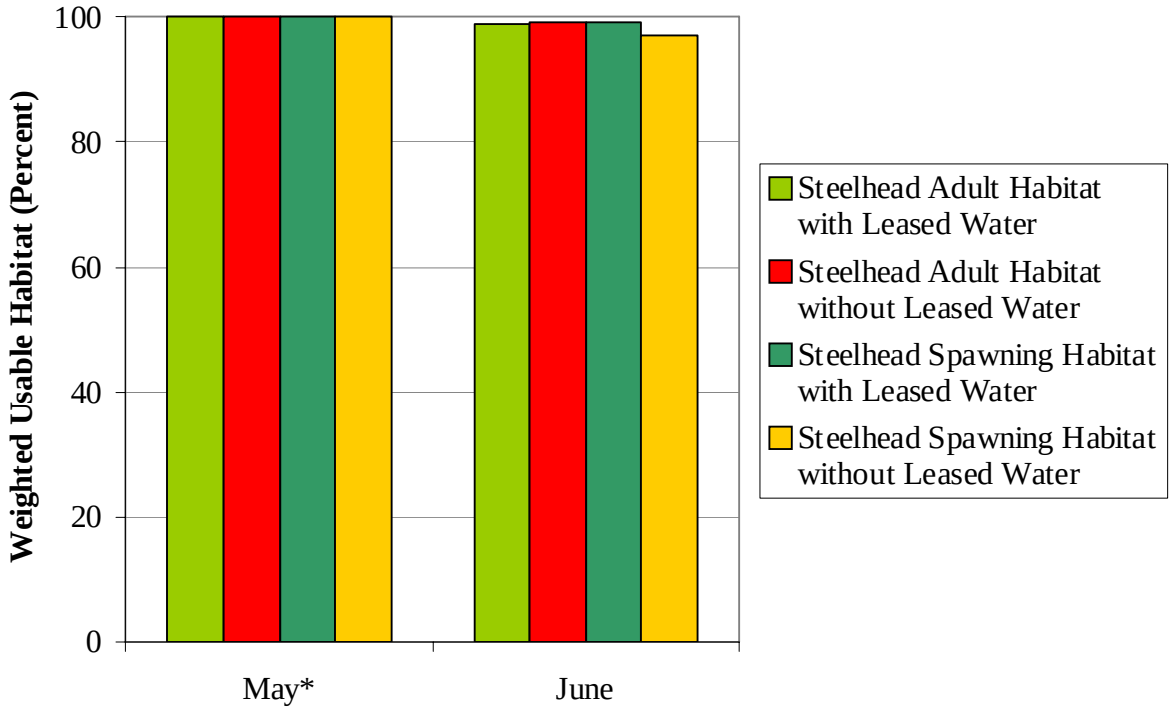


Figure 17. Percent weighted usable habitat for adult and spawning steelhead at mean monthly flows in 2007, including and excluding the leased 2.9 cfs. * Flows in May were beyond the modeled range.

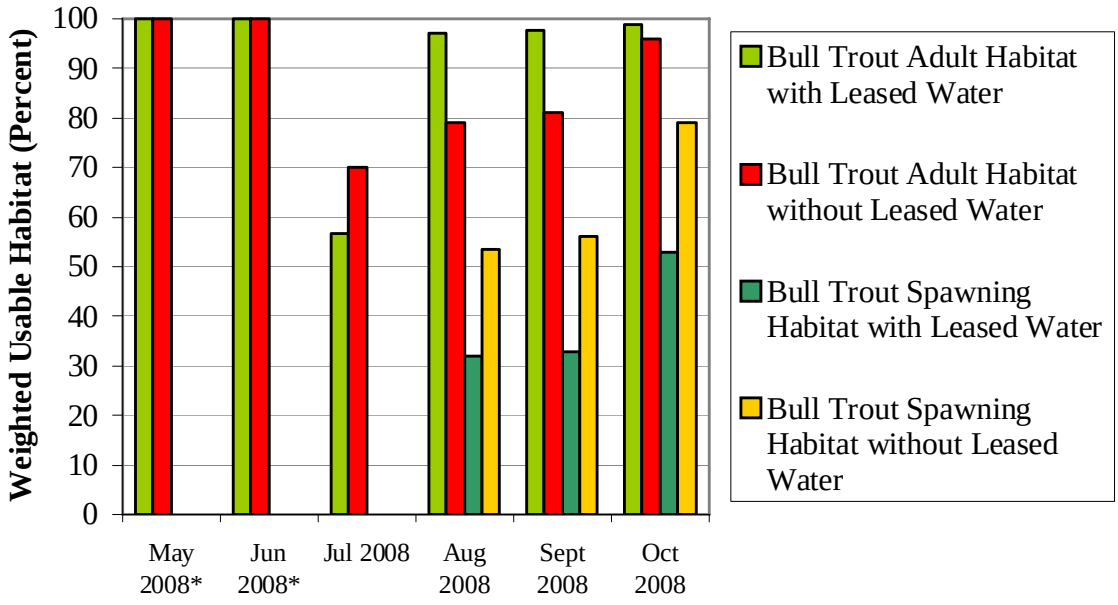


Figure 18. Percent weighted usable habitat for adult and spawning bull trout at mean monthly flows in 2008, including and excluding the leased 2.9 cfs. * Flows in May and June were beyond the modeled range.

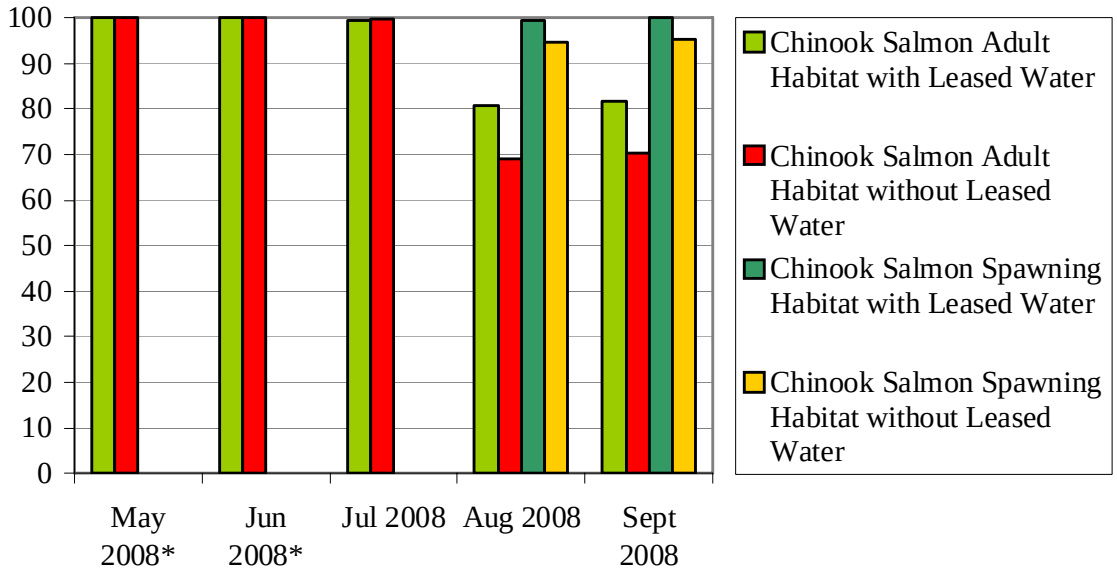


Figure 19. Percent weighted usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2008, including and excluding the leased 2.9 cfs. * Flows in May and June were beyond the modeled range.

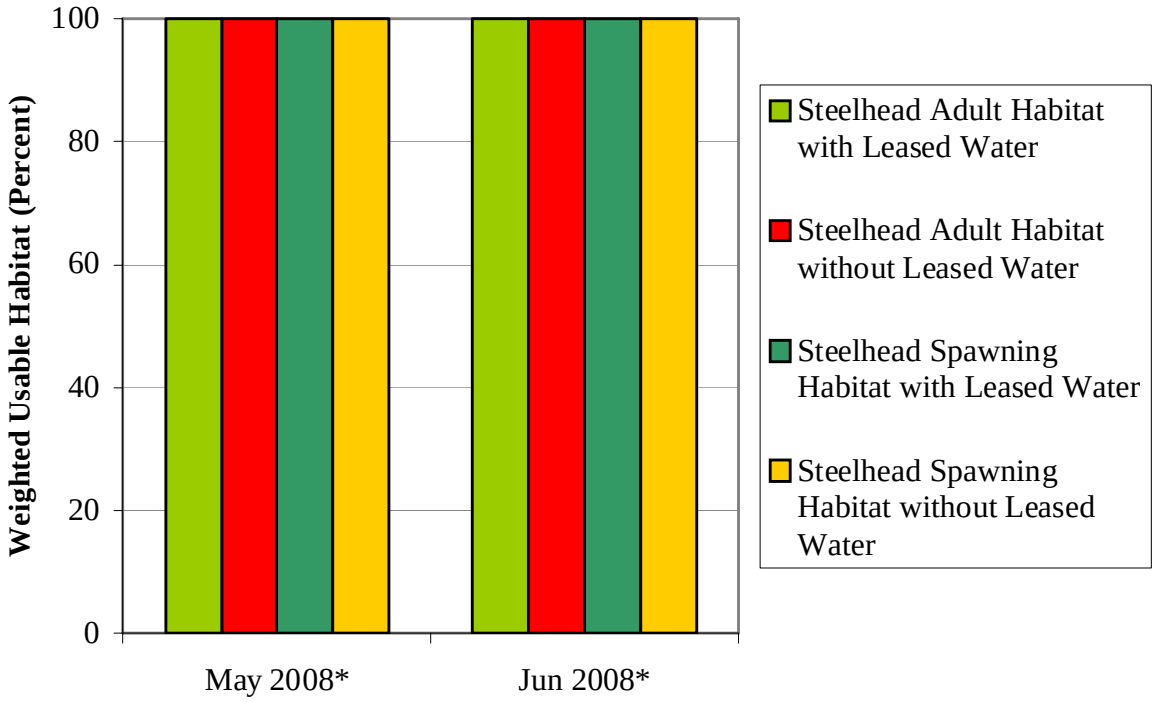


Figure 20. Percent weighted usable habitat for adult and spawning steelhead at mean monthly flows in 2008, including and excluding the leased 2.9 cfs. * Flows in May and June were beyond the modeled range.

Idaho Department of Fish and Game has been conducting bull trout redd counts in Fourth of July Creek since 2003 (Curet 2008). They show a marked increase in the total number of redds every year between 2003 and 2006 (Figure 21). There were declines in 2007 and 2008, which may be due to the effects of the 2005 fire in the basin. IDFG will continue to monitor redds to see if the recent decreases will be long-lasting.

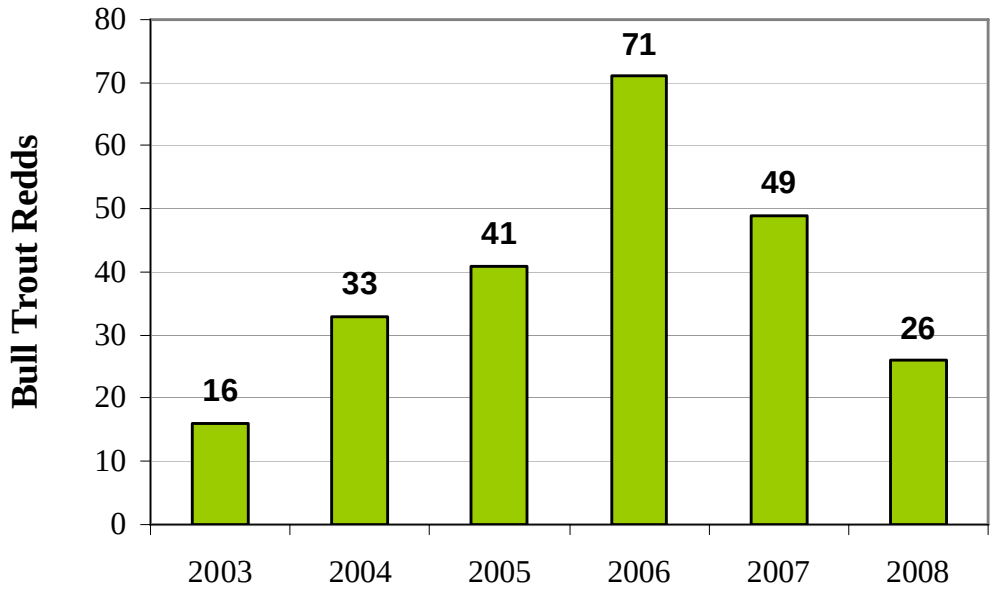


Figure 21. Annual counts of fluvial bull trout redds in Fourth of July Creek from 2003-2008 (Curet 2008).

Pole Creek – Stanley Basin

The Pole Creek project is not a traditional lease that dries up irrigated fields. Salmon Falls Sheep Company holds several water rights from Pole Creek. One of these is a hydropower right for 7 cfs that is used to generate power to operate pivots. This diversion, along with irrigation water rights has the ability to drop flows low enough to impede fish migration, raise temperatures, and reduce available fish habitat. In order prevent the reduction of flow below 5 cfs, IDWR and Salmon Falls Sheep Company initiated an agreement not to divert. In exchange for leaving at least 5 cfs of the hydropower right in Pole Creek during the irrigation season, the landowner is paid the operating cost of a generator to run his pivots. In 2006, IDWR developed a five-year agreement not to divert that will supply the landowner with a generator and the funds for fuel.

Site visits to Pole Creek on 7/25/2007, 8/1/2007, 8/13/2007, and 8/4/2008 confirmed that the landowner was complying with the terms of the agreement. A gage in Pole Creek monitored flow in the river during the irrigation season (Figure 22). Flows in Pole Creek during the term of the transaction never fell below 5 cfs. In 2007, the landowner utilized the diesel generator from June 26th through September 30th. In 2008, the irrigator had to turn on the generator for only one day in mid-August.

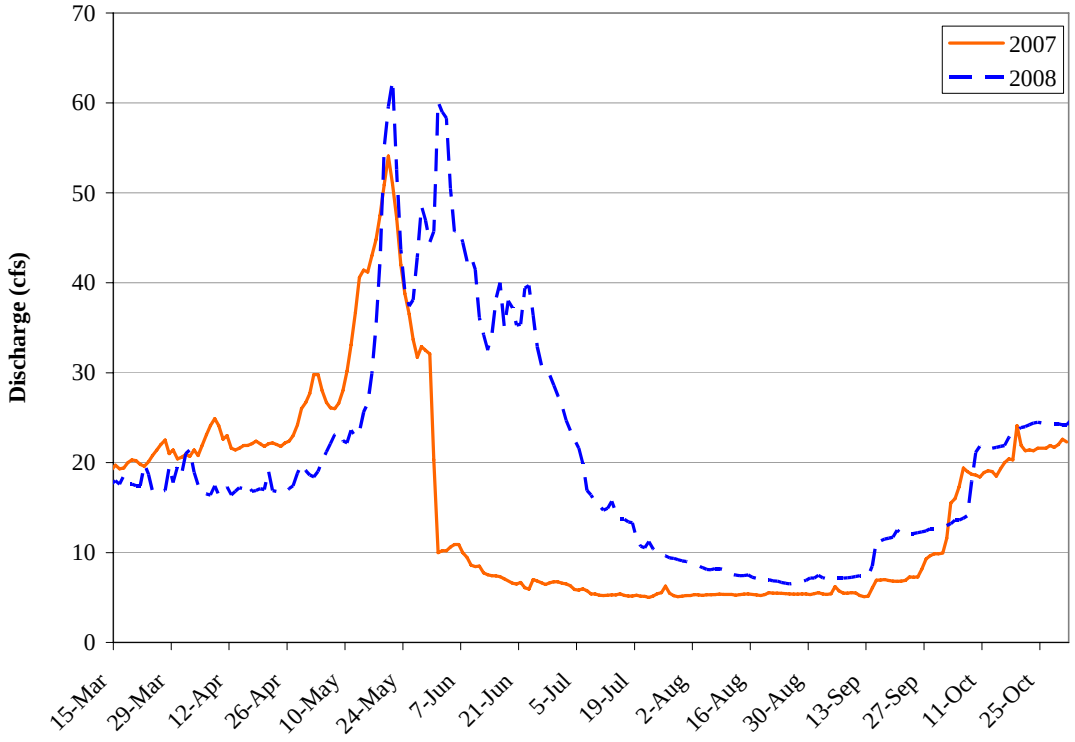


Figure 22. Pole Creek mean daily flow, May 1 to October 31.

Physical Habitat Simulation (PHABSIM) results from a study on Pole Creek (Maret et al. 2005) were used to develop habitat availability with leased water. Figures 23-25 represent the percentage of usable area for each species of concern. Juvenile habitat is not included due to limitations of the PHABSIM model.

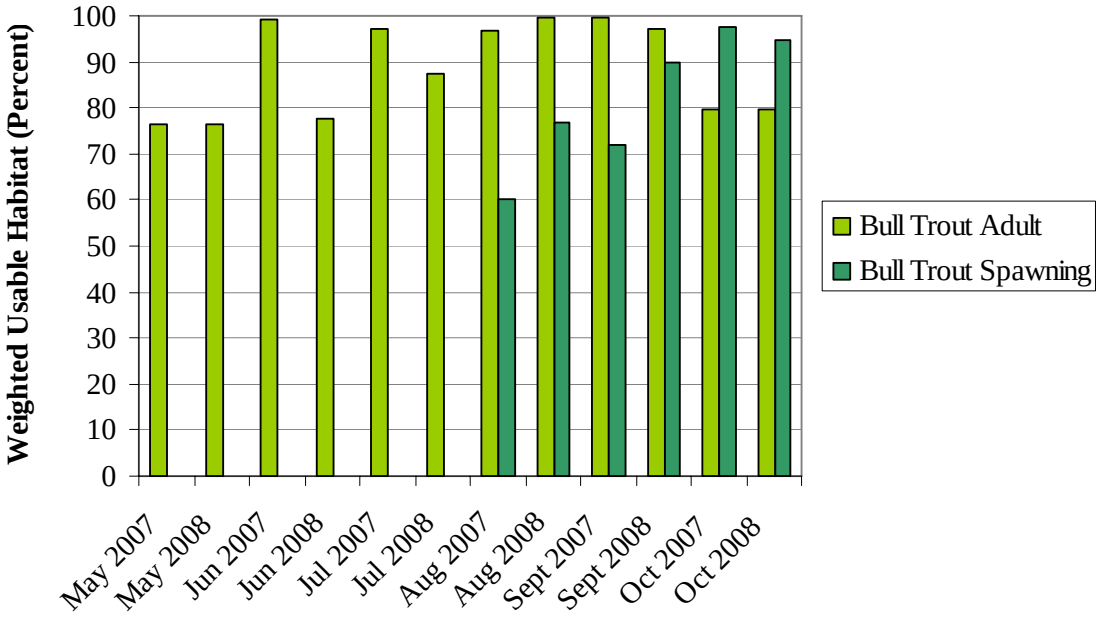


Figure 23. Percent weighted usable habitat for adult and spawning bull trout at mean monthly flows in 2007 and 2008.

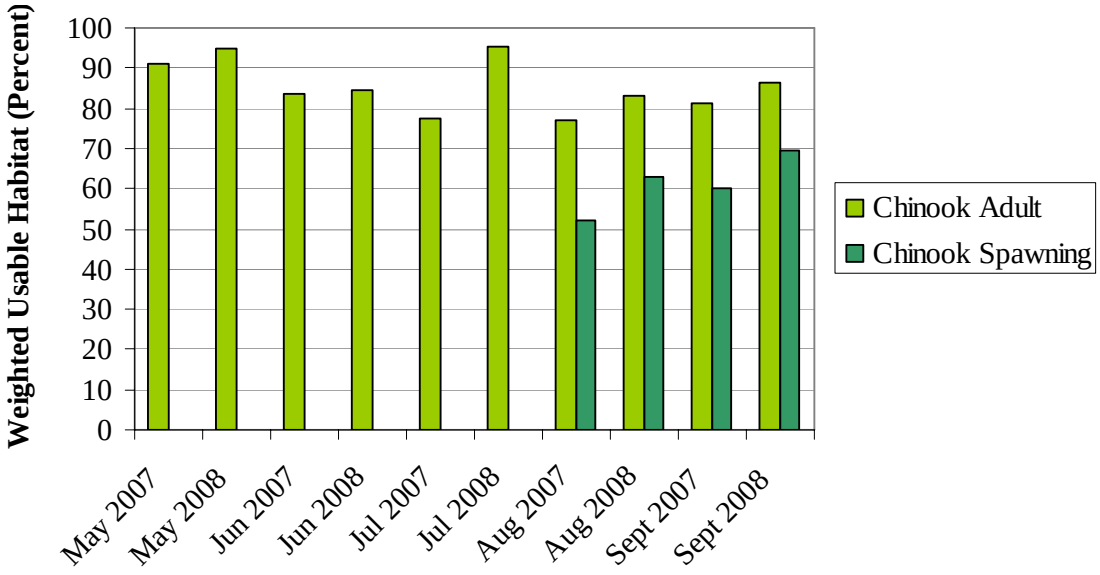


Figure 24. Percent weighted usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2007 and 2008.

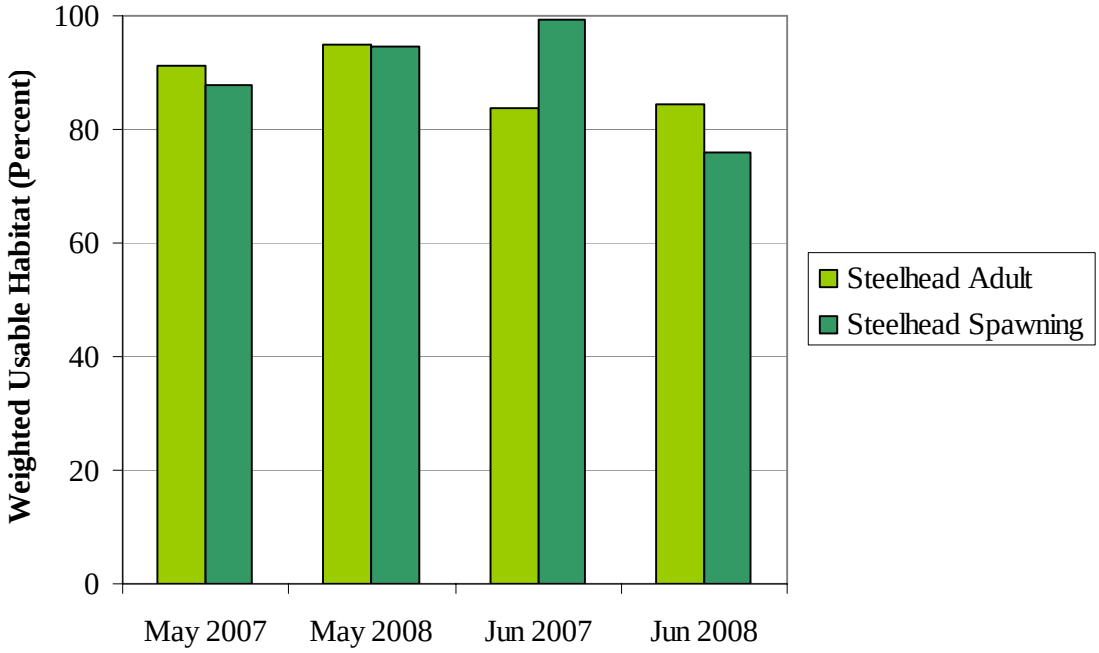


Figure 25. Percent weighted usable habitat for adult and spawning steelhead at mean monthly flows in 2007 and 2008.

Big Hat Creek – Mainstem Salmon River Basin (Valley Creek-Pahsimeroi River)

IDWR negotiated two one-year leases in 2007 and 2008 with Erik Storlie and Tamara Kaiser for 0.5 cfs, formerly irrigating 35 acres. The water was leased from April 1 to Oct. 31. Approximately 3.4 miles of lower Big Hat Creek was reconnected to Hat Creek. This provided fish access to the upper reaches of Big Hat Creek.

Site visits to Big Hat Creek on 8/14/2007 and 9/2/2008 confirmed that the landowners were complying with the terms of the lease. Landsat images also show that the leased water was not being used to irrigate land (Appendix A). The gage on Big Hat Creek was transferred to Iron Creek, due to a lack of funds for an additional gage, and the respective importance of the Iron Creek transaction. Flow measurements at the time of the site visits showed 0.9 cfs and 0.6 cfs respectively. This Big Hat transaction removes the only diversion on Big Hat Creek, returning the stream to a natural flow. With seasonal site visits and Landsat verification, IDWR is confident that stream flows in Big Hat Creek obtain the biological objective of reconnecting Big Hat Creek for threatened bull trout.

There has been no PHABSIM modeling of Big Hat Creek. The lease is on an Upper Salmon Basin Watershed Program (USBWP) Screening and Habitat Improvement Prioritization in the Upper Salmon Subbasin (SHIPUSS) high priority stream for flow enhancement within an ESU.

Morgan Creek – Mainstem Salmon River Basin (Valley Creek-Pahsimeroi River)

In early 2007, IDWR developed two one-year agreements not to divert on Morgan Creek. The agreements provide a minimum flow of 2 cfs in the lower end of Morgan Creek, which would normally run dry. The irrigators agreed to pump water out of a Salmon River ditch instead of drying up Morgan Creek, whenever flows approached 2 cfs. This flow provides a partial reconnection to important spawning and rearing habitat for Chinook salmon and steelhead.

Site visits to Morgan Creek on 7/12/2007, 8/13/2007, 9/10/2007, 6/2/2008, 8/5/2008, and 9/15/2008 confirmed that the landowners were complying with the terms of the agreement. An Aquarod on loan from the US Forest Service monitored flows at the lower end of the primary reach (Figure 26). Flows did drop below 2 cfs for several days at a time throughout the irrigation season in 2007. A rating curve was developed for the primary reach, making it possible to identify the stage that corresponds to 2 cfs. That information made it easier for the landowners to regulate flows in 2008.

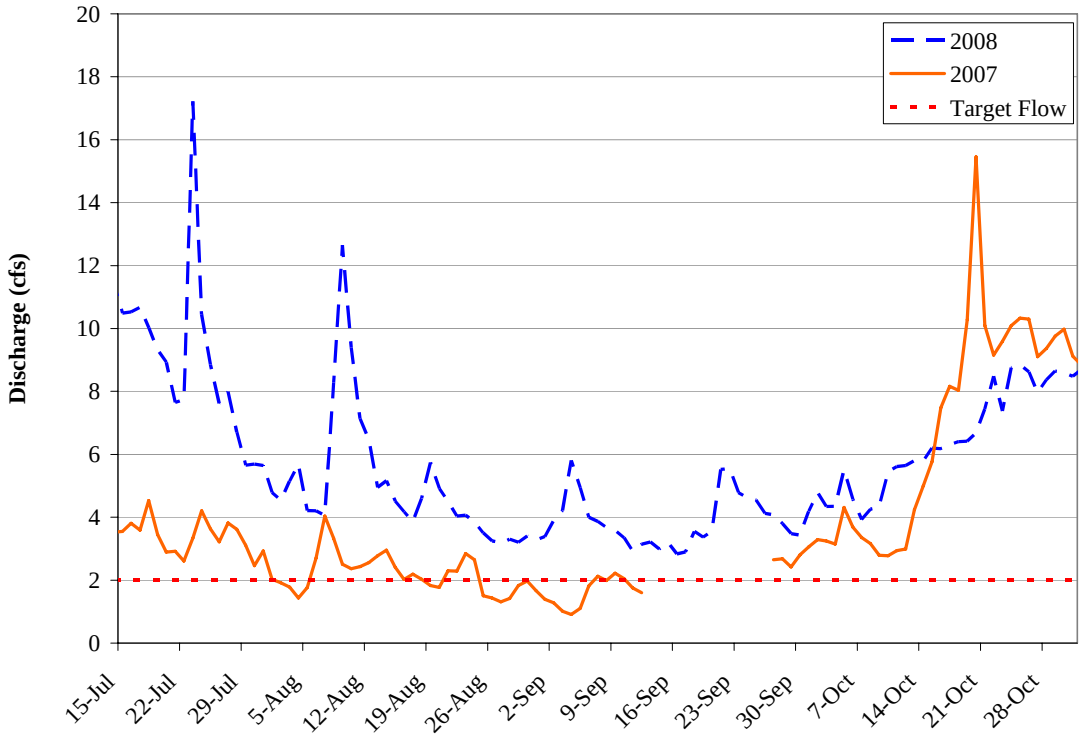


Figure 26. Morgan Creek mean daily flow below Highway 93, July 15 to October 30.

Habitat assessment was conducted on August 9th, 2007 in a 145-meter reach in the previously de-watered reach. Riffle habitat made up 65% of the stream, glide-runs were 11%, and scour pools made up 23% of the habitat. Deciduous trees, with some riparian shrubs, dominate stream bank vegetation. Ideal Chinook salmon and steelhead spawning substrate particle size in Idaho ranges from fine gravel (6-7mm) to large cobble (128-255 mm) (Maret et al. 2003). Eighty-five percent of the substrate sampled in Morgan Creek fell into the ideal spawning size range for Chinook salmon and steelhead (Figure 27). A PHABSIM study conducted on Morgan Creek in 2005 did not model flows below 10 cfs.

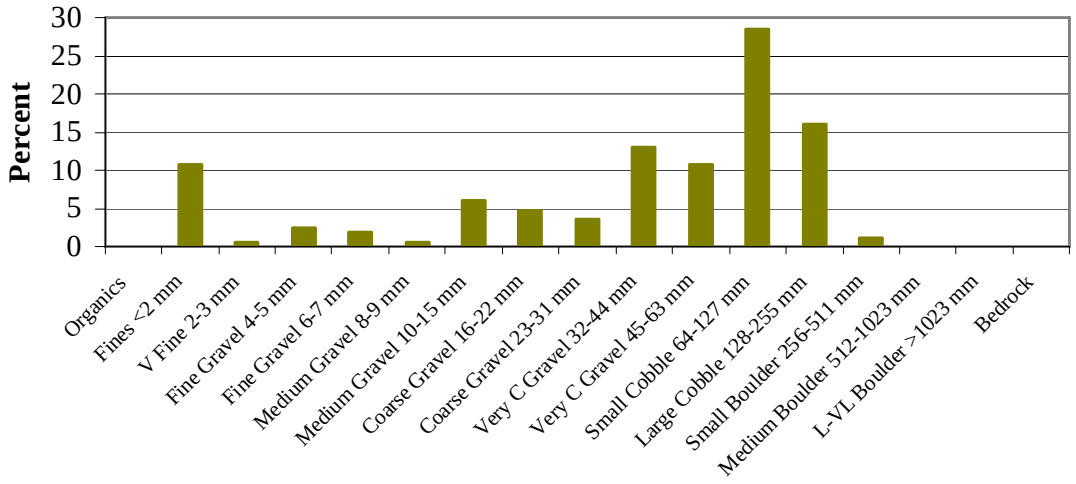


Figure 27. Morgan Creek substrate size distribution as sampled in a 145-meter reach above the Salmon River Ditch on August 10, 2007.

Pahsimeroi P-9 Projects – Pahsimeroi River Basin

The Pahsimeroi P-9 project consisted of a set of four 20-year agreements not to divert. The goal of the P-9 ditch removal project was to remove the P-9 ditch and its associated cross ditch. The cross ditch intercepted flows from two spring creeks and transported the flow across an alkali flat. The cross ditch dumped into the Pahsimeroi River and was then picked up by the P-9 ditch. The P-9 ditch intercepted another spring creek and could cause passage problems at the diversion due to low flows. The project leaves almost 30 cfs in the Pahsimeroi River at P-9, Mud Springs Creek, Patterson/Big Springs Creek, and Duck Springs (distribution of that flow is not well defined). The water is now pumped out of the Pahsimeroi lower in the system, where flow is not limited.

Site visits on 6/9/2008, 6/26/2008, and 9/30/2008 confirmed that the landowners were complying with the terms of the agreement. A gage in the Pahsimeroi River monitored flows during the irrigation season (Figure 28). The Pahsimeroi River maintained a base flow of approximately 10 cfs in 2008, compared to previous years when flow dropped to almost zero intermittently. A gage was also installed on Patterson/Big Springs Creek, but that data is not yet available.

IDFG conducted biologic monitoring of the reaches affected by the P-9 projects and found the following (Warren 2008):

- A Chinook salmon redd in Patterson/Big Springs above the cross ditch
- A Chinook salmon redd in Patterson/Big Springs downstream of the cross ditch
- 8 adult Chinook adults observed in Patterson/Big Springs
- Juvenile Chinook in Duck Springs and Muddy Springs Creek in 2007
- Wild rainbow/steelhead, sculpin, and brook trout in the Pahsimeroi River, Duck Springs, and Patterson/Big Springs in 2008

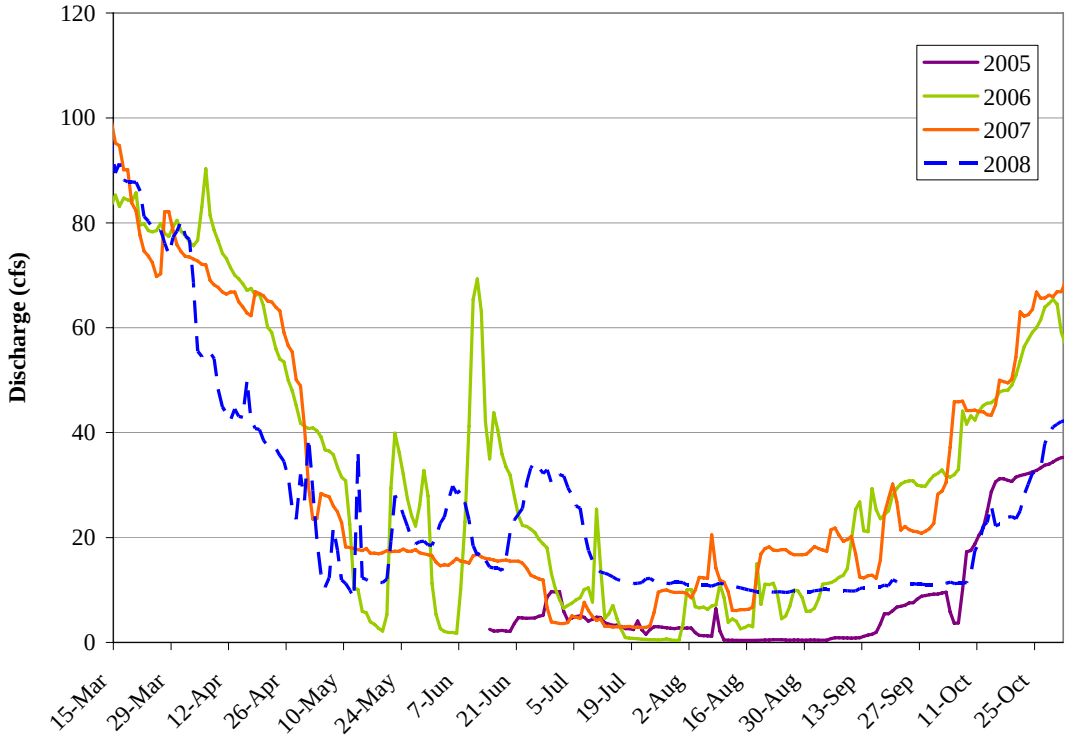


Figure 28. Pahsimeroi River mean daily flow below the P-9 ditch, March 15 to October 30.

Iron Creek Phase II– Mainstem Salmon River Basin (Pahsimeroi River – Lemhi River)

The Iron Creek Phase II project is a twenty-year full-season agreement not to divert. Clyde and Janelle Phillips added a point of diversion on the Salmon River and agreed not to divert 7.08 cfs from Iron Creek, an USBWP SHIPUSS high priority stream. The water provides a reconnection to important spawning and rearing habitat for Chinook salmon and steelhead.

Site visits to Iron Creek on 8/15/2007 and 7/23/2008 confirmed that the landowner was complying with the terms of the agreement. A gage in Iron Creek monitored flow in the river during the irrigation season (Figures 29 and 30).

There has been no PHABSIM modeling of Iron Creek.

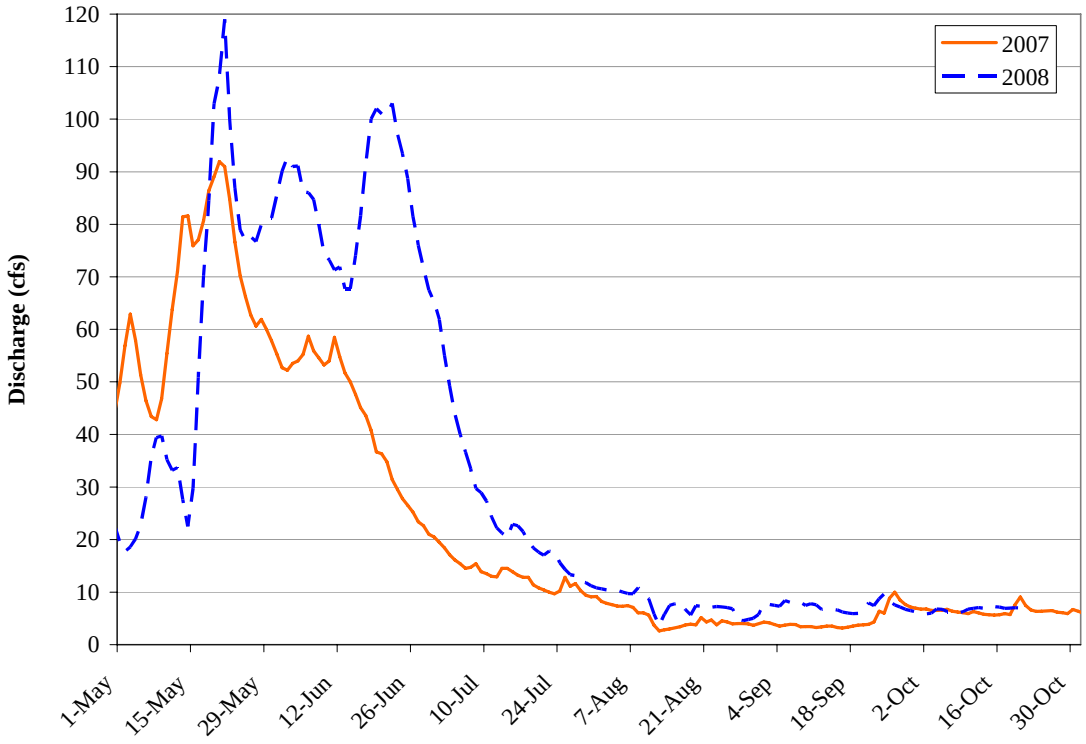


Figure 29. Iron Creek mean daily flow below Phillip's Bridge, May 1 to October 31.

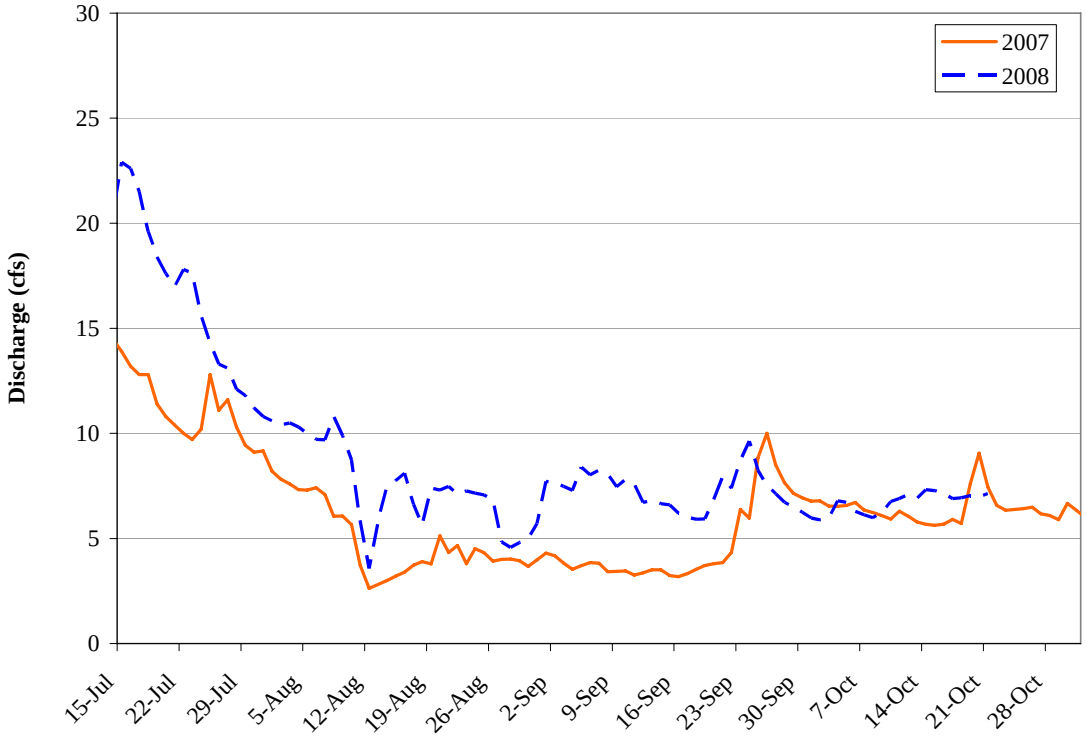


Figure 30. Iron Creek mean daily flow below Phillip's bridge, July 1 to October 31.

Lemhi River Agreement not to Divert - Lemhi River Basin

Through agreements not to divert water at the L6 diversion with 11 landowners, in cooperation with Water District 74, water was acquired, as needed, to maintain up to 35 cfs from May 15 through November 15. Water was acquired for 60 days in 2007 and 42 days in 2008. The water provided passage flows necessary for in-migrating adult spring Chinook salmon and steelhead, and for out migrating salmon and steelhead smolts.

Rick Sager, the WD 74 Watermaster, administered this project. He adjusted the flows at L6 to meet the Lemhi Conservation Agreement flows. NMFS also monitored the real-time flow at USGS Lemhi River gage at L5, to ensure compliance with the Agreement. Figure 31 shows the flows at L5 when the Lemhi River was in regulation.

IDFG conducted biologic monitoring in the Lemhi Basin and found the following:

- 19 Chinook salmon redds in the Lemhi River in 2007 (Figure 32)
- 25 Chinook salmon redds in the Lemhi River in 2008 (Figure 32)
- Outmigrating steelhead and Chinook salmon in the Lower Lemhi River (Figures 33 and 34)

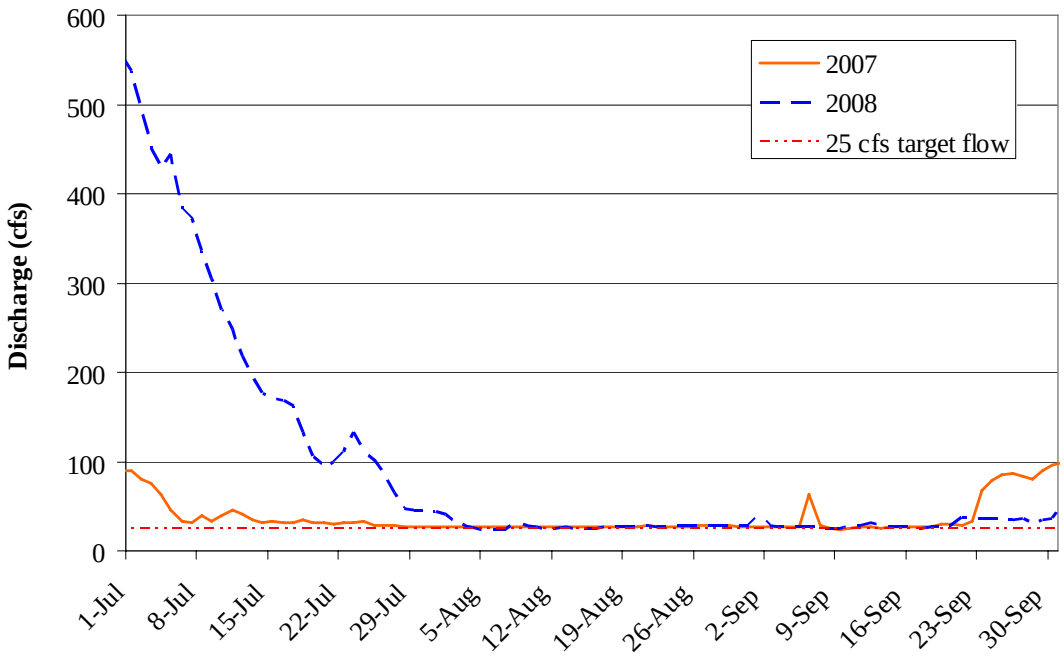


Figure 31. Lemhi River mean daily flow at L5, July 1 to September 30.

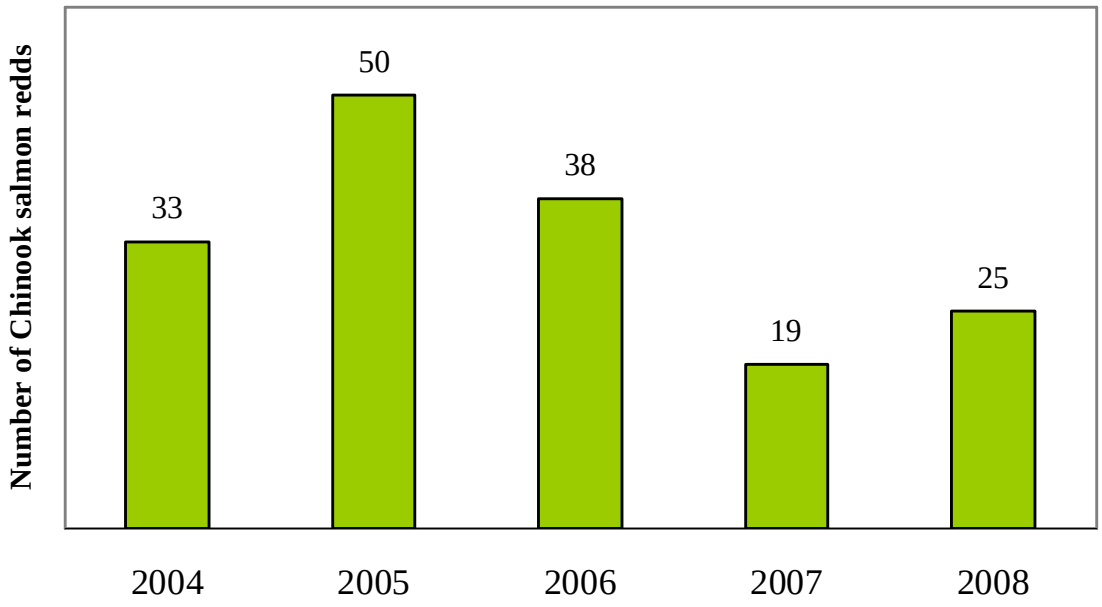


Figure 32. Lemhi River and Hayden Creek Chinook salmon redds 2004-2006 (Lutch 2006, Curet 2008).

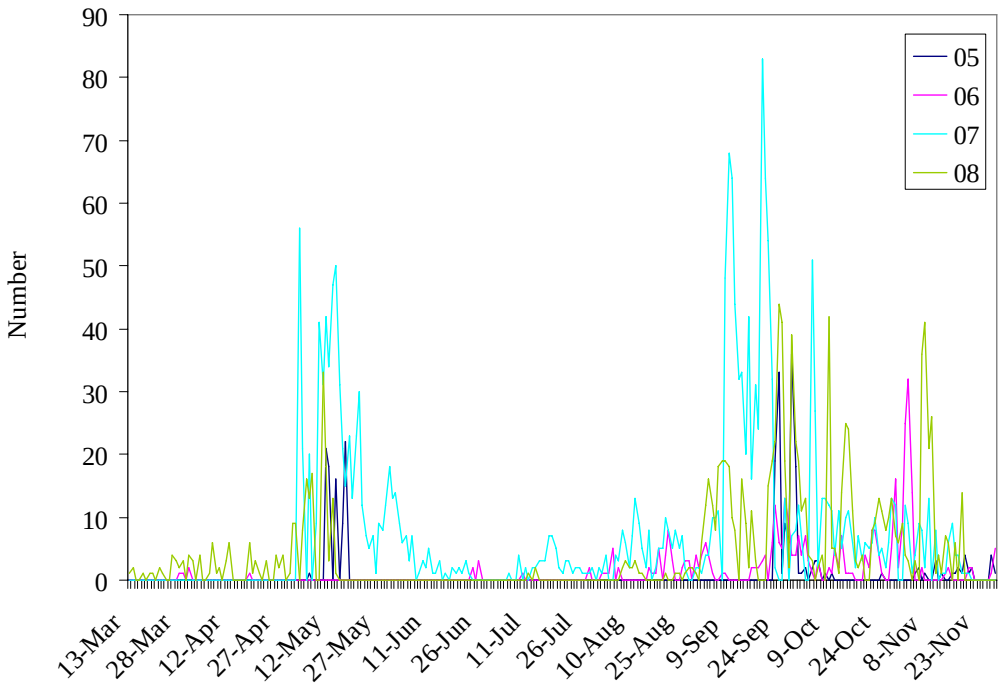


Figure 33. Daily juvenile rainbow/steelhead trout capture at the Lower Lemhi screw trap 2005-2008 (Curet 2008).

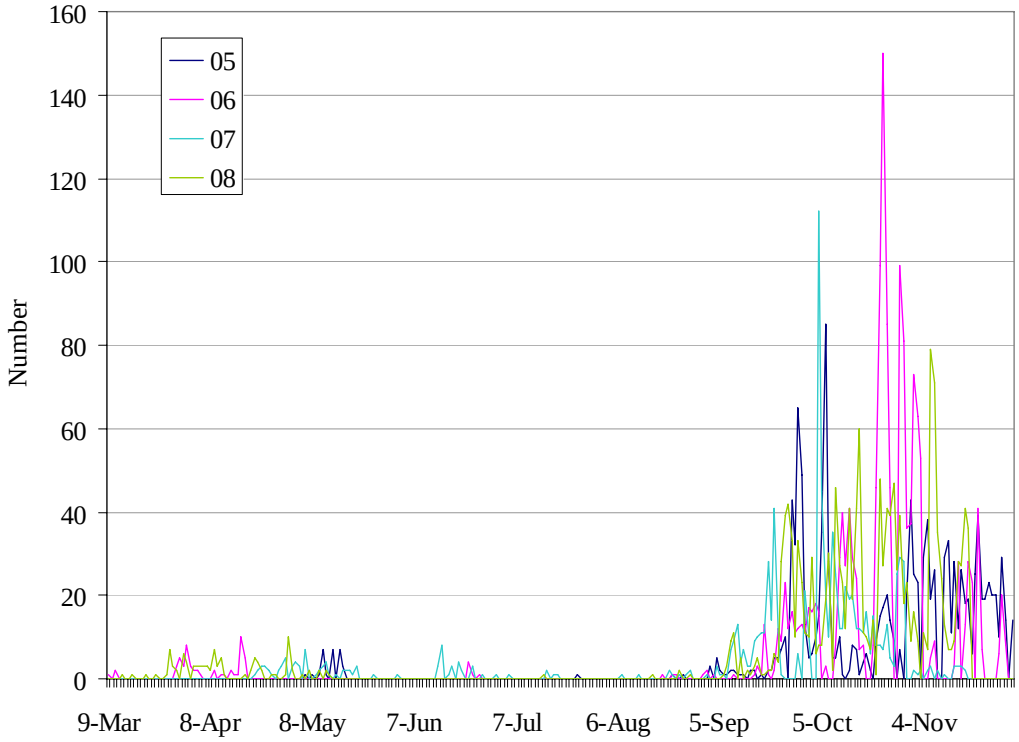


Figure 34. Daily juvenile Chinook salmon capture at the Lower Lemhi screw trap 2005-2008 (Curet 2008).

Eighteenmile Creek – Upper Lemhi River Basin

The Eighteenmile Creek project is a ten-year partial season lease with the Ellsworth Angus Ranch providing 0.5 cfs, formerly irrigating 26 acres. 2007 and 2008 were the third and fourth year of the transaction. The water was leased from June 1 to November 15. This lease eliminates the use of a ditch that crosses Hawley Creek, thus reconnecting Hawley Creek with Eighteen Mile Creek, and the Lemhi River, when sufficient flows are present.

Site visits to Eighteenmile Creek on 6/21/2007, 8/16/2007, and 7/24/2008 confirmed that the landowner was complying with the terms of the leases. Landsat images also show that the leased water was not being used to irrigate land (Appendix A). A gage in Eighteenmile Creek monitored flow during the irrigation season (Figure 35). There was no flow available between June and September during 2007, but Eighteenmile Creek maintained mean monthly flows of 1.4 cfs, 1.6 cfs, and 5.7 cfs during the months of July 2008, August 2008, and September 2008 respectively.

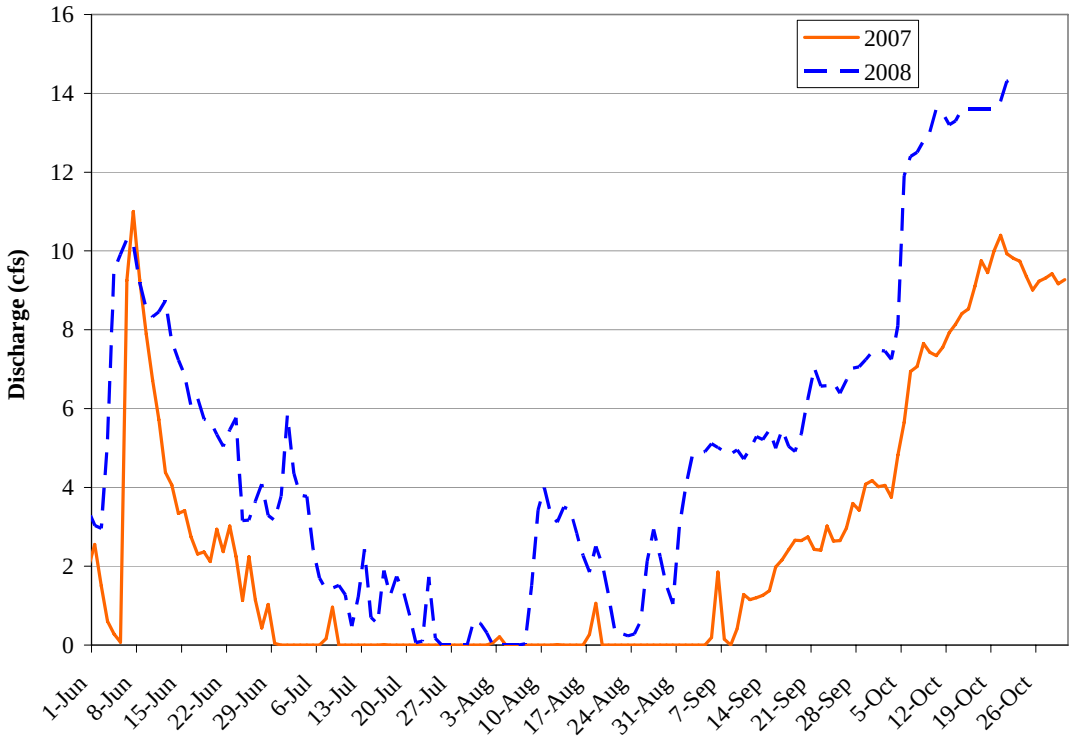


Figure 35. Eighteenmile Creek mean daily flow below confluence with Hawley Creek, June 1 to October 31.

Habitat assessment was conducted on August 10t^{h}, 2007 in a 242-meter reach below the confluence with Hawley Creek. Unfortunately, the stream was dry during that time, so it was impossible to collect a complete data set. The reach had an average bankful width of 4.0 meters. Riparian vegetation was predominately grass. Ideal Chinook salmon and steelhead spawning substrate particle size in Idaho ranges from fine gravel (6-7mm) to large cobble (128-255 mm) (Maret et al. 2003). Eighty-six percent of the substrate sampled in Eighteenmile Creek fell into the ideal spawning size range for Chinook salmon and steelhead (Figure 36).

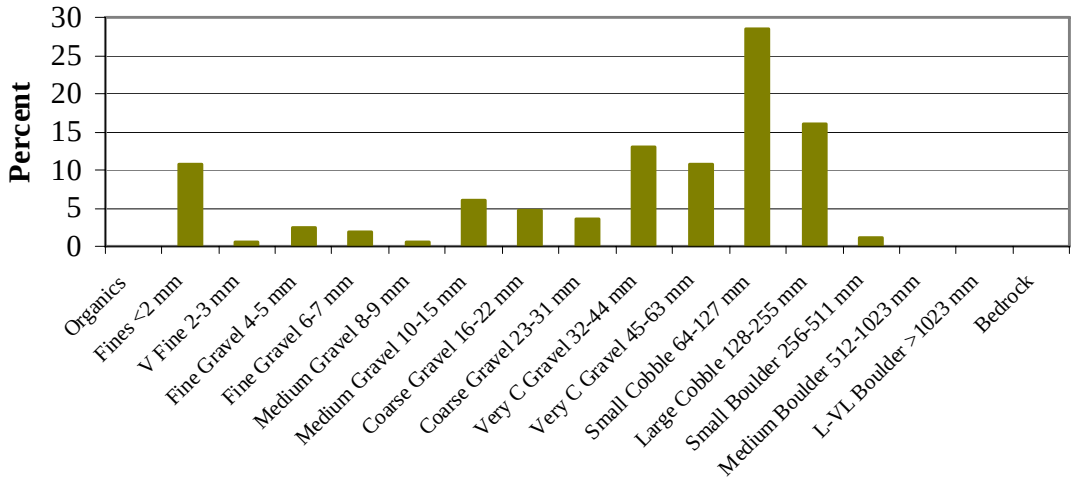


Figure 36. Eighteenmile Creek substrate size distribution as sampled in a 242-meter reach below the confluence with Hawley Creek on August 10, 2007.

Physical Habitat Simulation (PHABSIM) results from a study on Eighteenmile Creek (Morris and Sutton 2007) were used to develop habitat availability with and without the 0.5 cfs of leased water. Figures 37-42 represent the percentage of usable area for each species of concern. Juvenile habitat is not included due to limitations of the PHABSIM model.

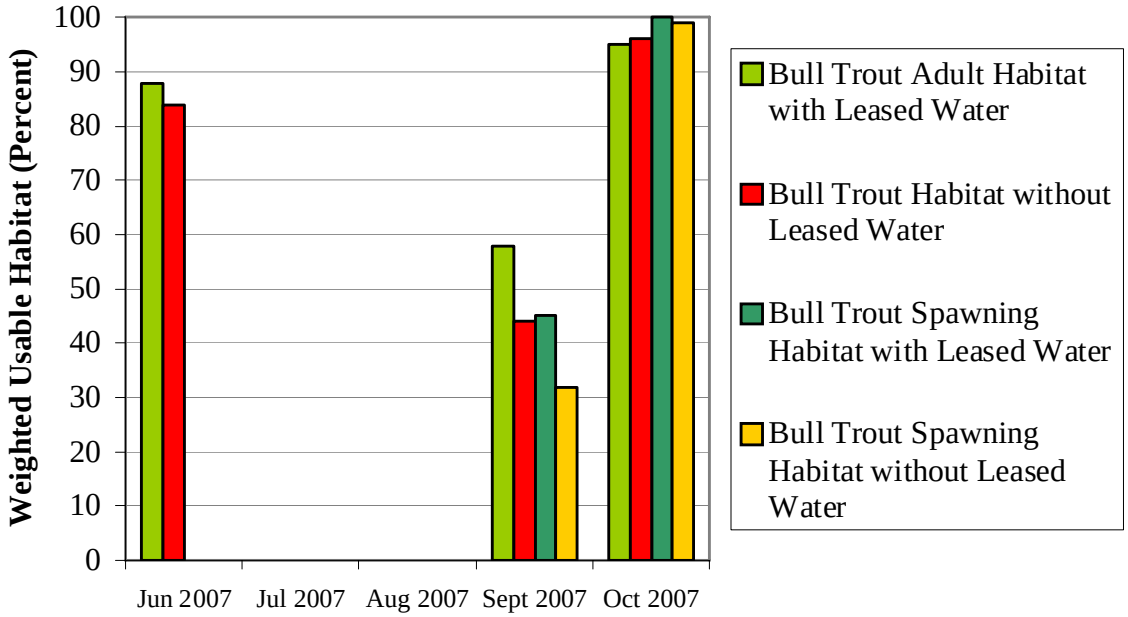


Figure 37. Percent weighted usable habitat for adult and spawning bull trout at mean monthly flows in 2007, including and excluding the leased 0.5 cfs.

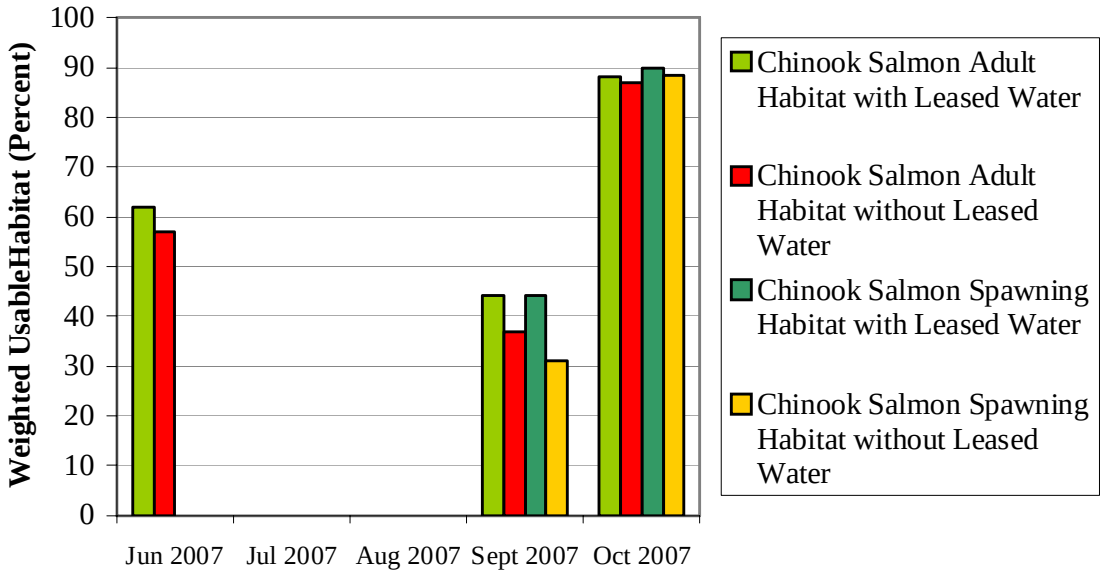


Figure 38. Percent weighted usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2007, including and excluding the leased 0.5 cfs.

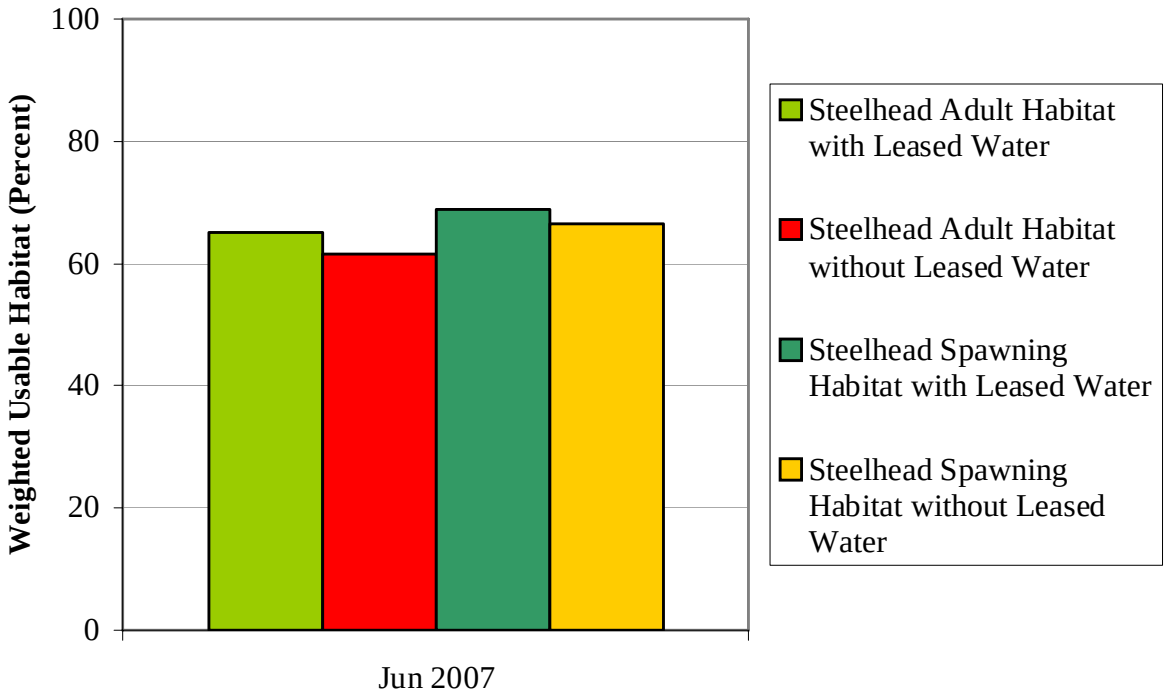


Figure 39. Percent weighted usable habitat for adult and spawning steelhead at mean monthly flows in 2007, including and excluding the leased 0.5 cfs.

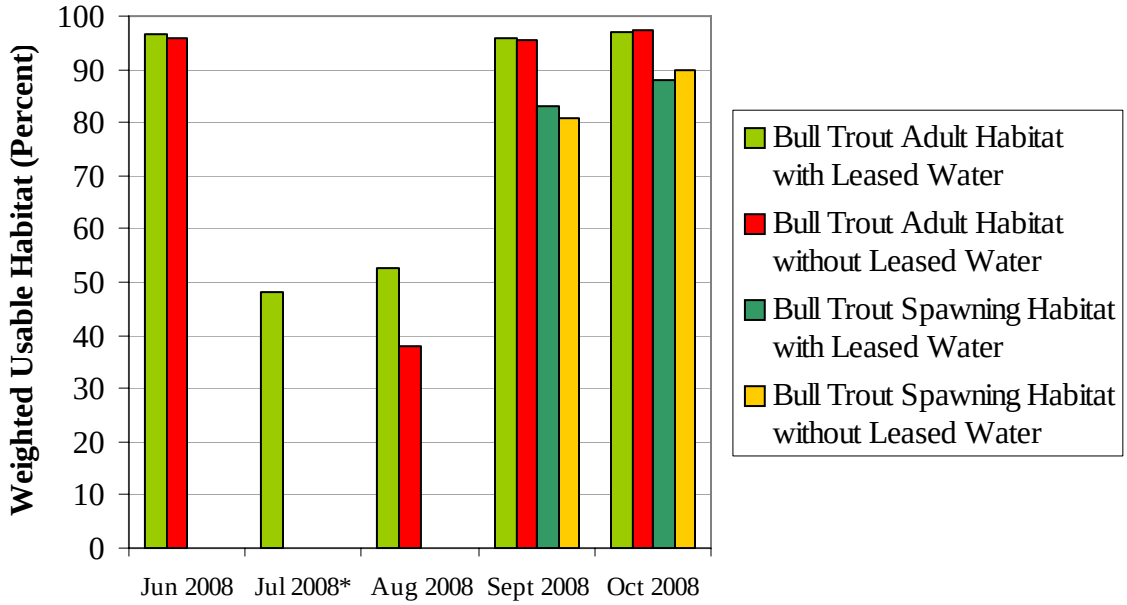


Figure 40. Percent weighted usable habitat for adult and spawning bull trout at mean monthly flows in 2008, including and excluding the leased 0.5 cfs. * Flows in July without leased water were beyond the modeled range.

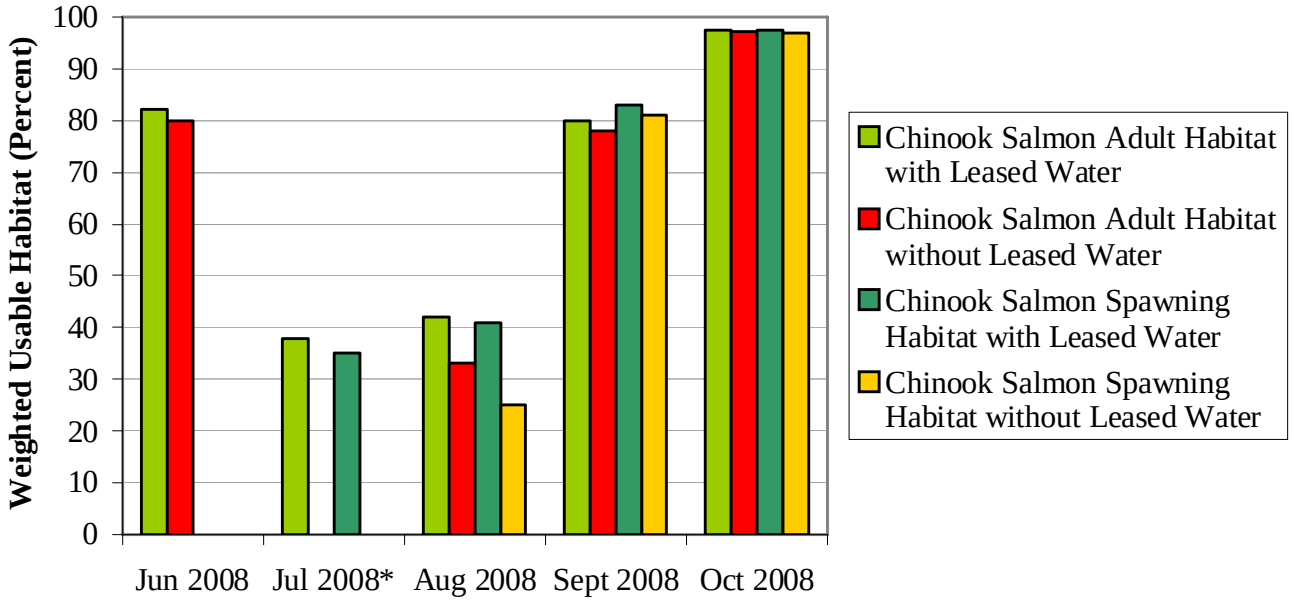


Figure 41. Percent weighted usable habitat for adult and spawning Chinook salmon at mean monthly flows in 2008, including and excluding the leased 0.5 cfs. * Flows in July without leased water were beyond the modeled range.

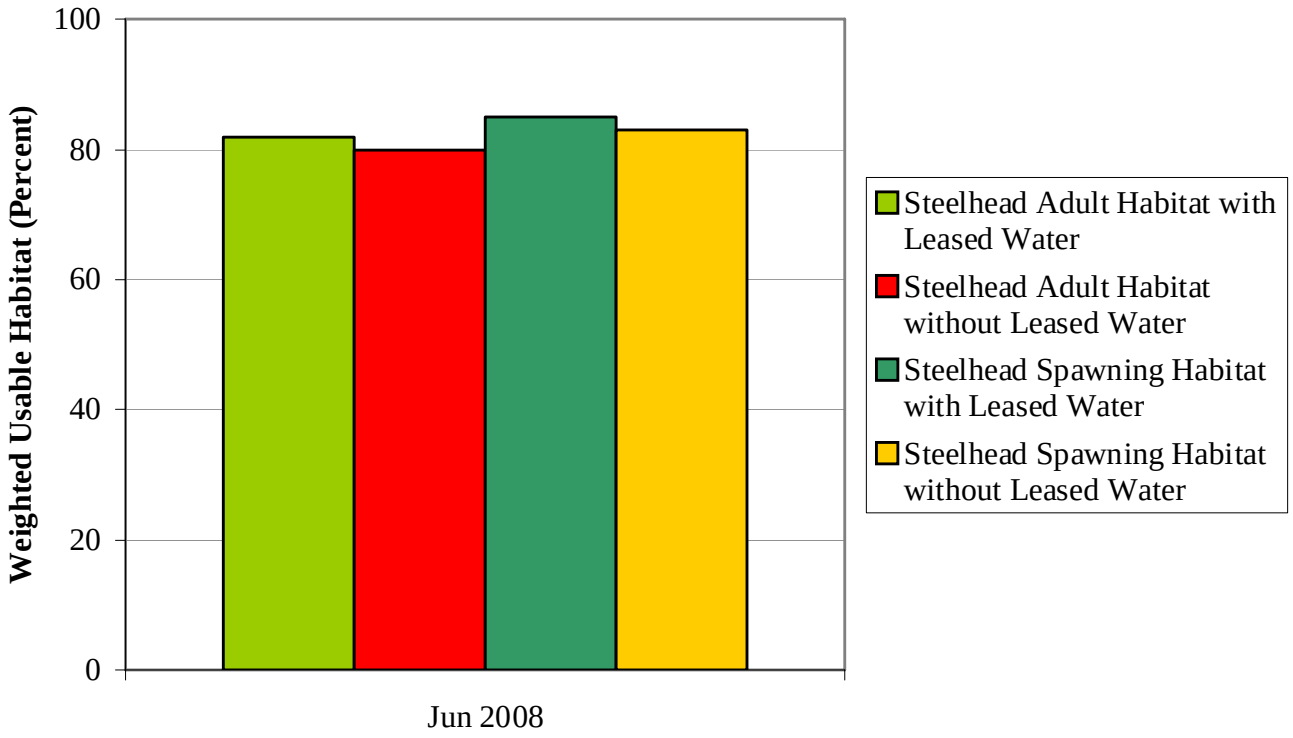


Figure 42. Percent weighted usable habitat for adult and spawning steelhead at mean monthly flows in 2008, including and excluding the leased 0.5 cfs.

Whitefish Ditch – Lemhi River Basin

The Whitefish Ditch project removed a 2.8 mile long ditch that intercepted Eighteenmile Creek, Canyon Creek, and an unnamed stream before arriving at the place of use. This 19-year agreement not to divert leaves up to 7.54 cfs in the upper reaches of the Lemhi River, by moving the point of diversion 2.5 miles downstream. The elimination of this ditch also eliminated passage and flow barriers at Eighteenmile Creek and Canyon Creek.

Site visits on 7/23/2008 and 8/19/2008 confirmed that the landowner was complying with the terms of the agreement. Gages in Canyon Creek and the Lemhi River monitored flow during the irrigation season (Figures 43 and 44). Canyon Creek maintained a base flow of approximately 3-4 cfs, and the Lemhi River stayed between 5 and 15 cfs for the majority of the irrigation season.

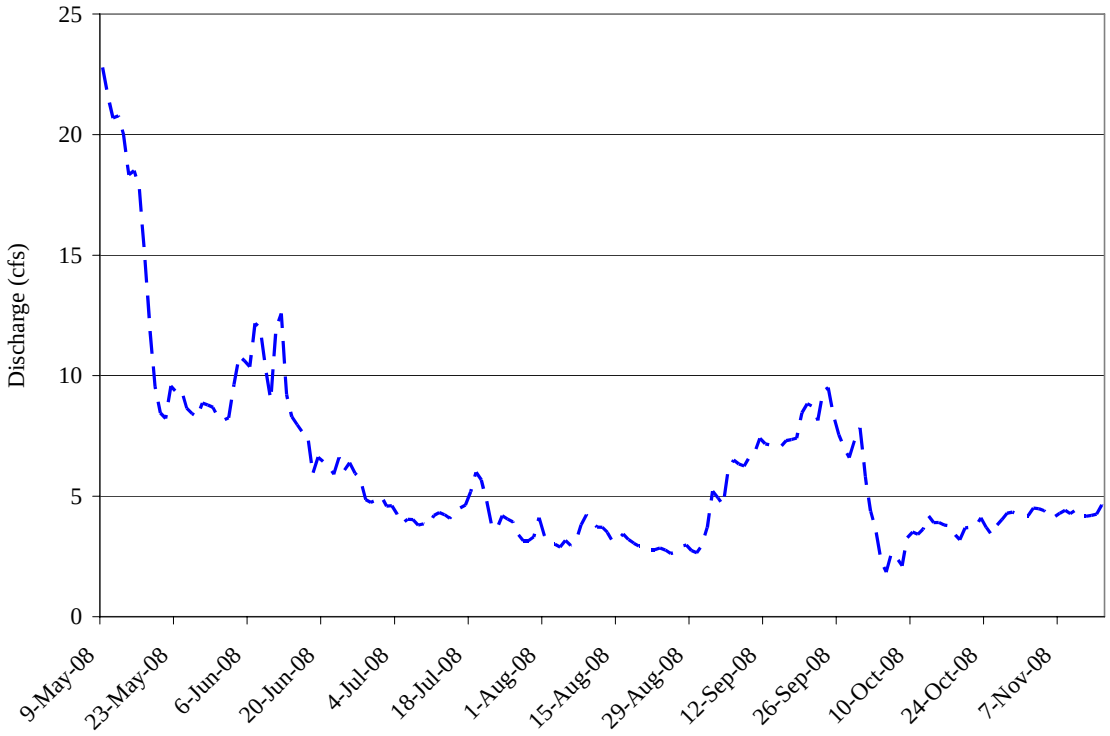


Figure 43. Canyon Creek mean daily flow below confluence with Whitefish Ditch, May 9 to November 15, 2008.

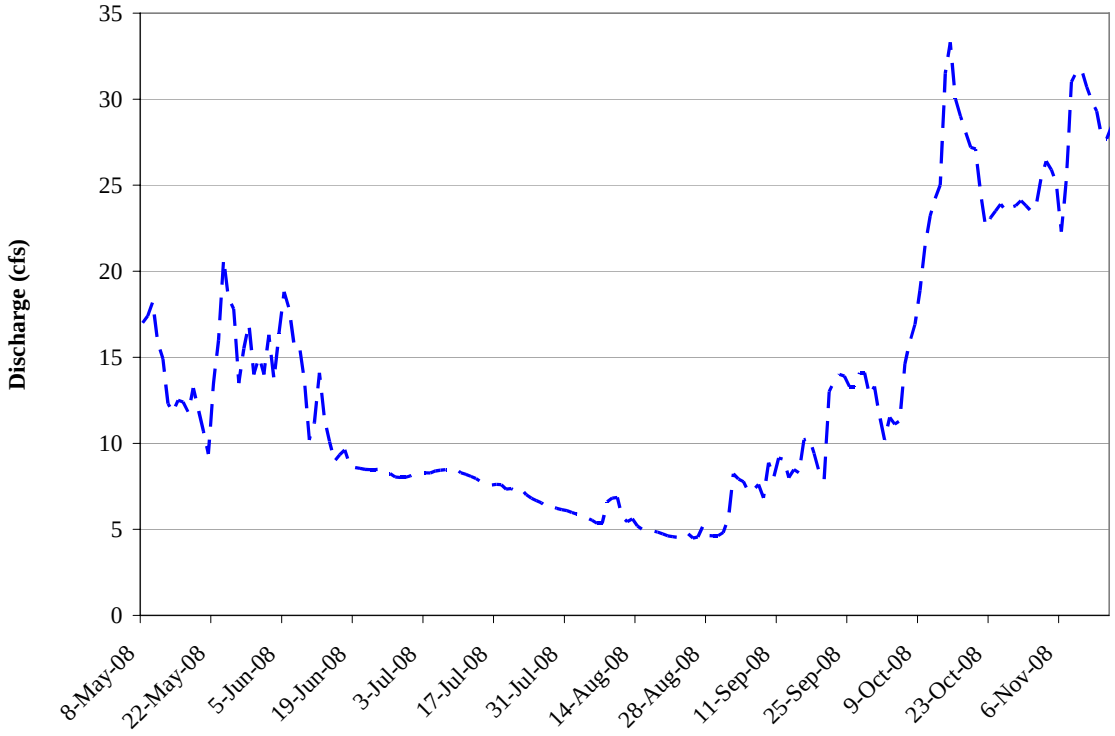


Figure 44. Lemhi River mean daily flow above L-63 diversion, May 8 to November 15, 2008.

Physical Habitat Simulation (PHABSIM) results from a study on Canyon Creek and the Upper Lemhi River (Morris and Sutton 2006) were used to develop habitat availability for those streams. Figures 45-50 represent the percentage of usable area for each species of concern. Juvenile habitat is not included due to limitations of the PHABSIM model.

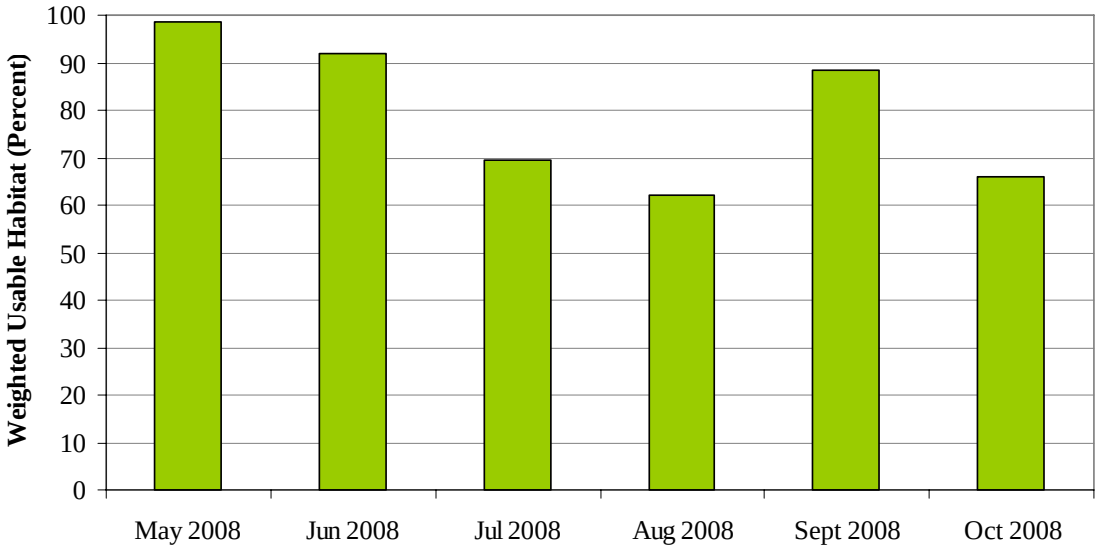


Figure 45. Percent weighted usable habitat for adult bull trout in Canyon Creek at mean monthly flows in 2008. No spawning habitat was available during September and October.

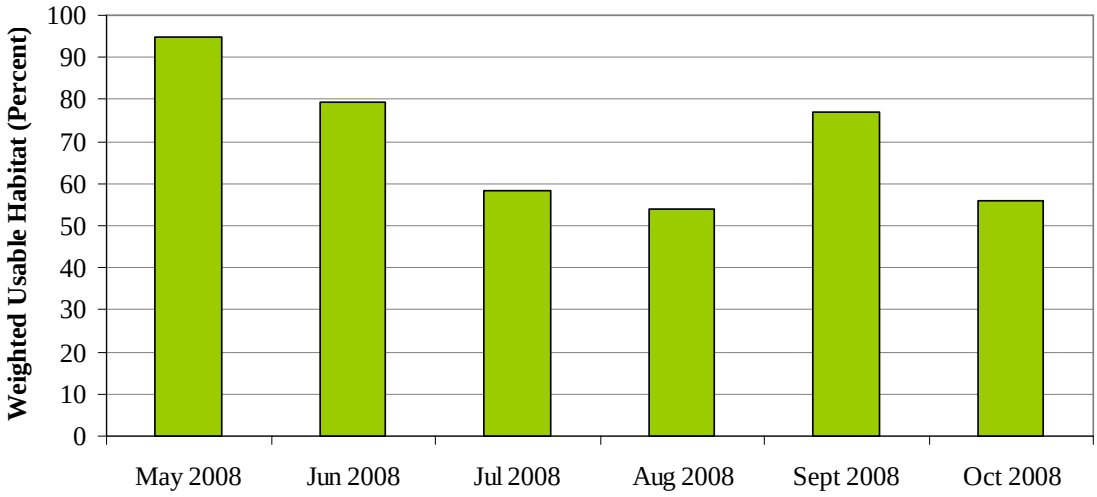


Figure 46. Percent weighted usable habitat for adult Chinook salmon in Canyon Creek at mean monthly flows in 2008. No spawning habitat was available between July and October.

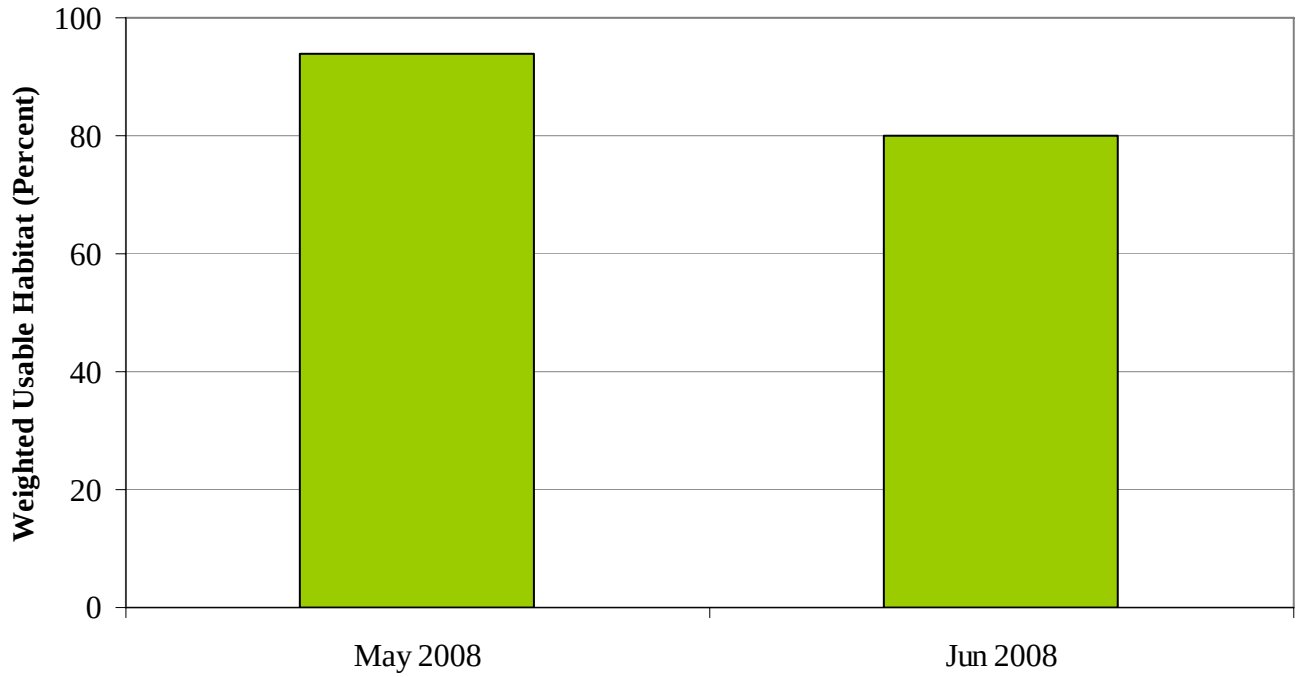


Figure 47. Percent weighted usable habitat for adult steelhead in Canyon Creek at mean monthly flows in 2008. No spawning habitat was available in May and June.

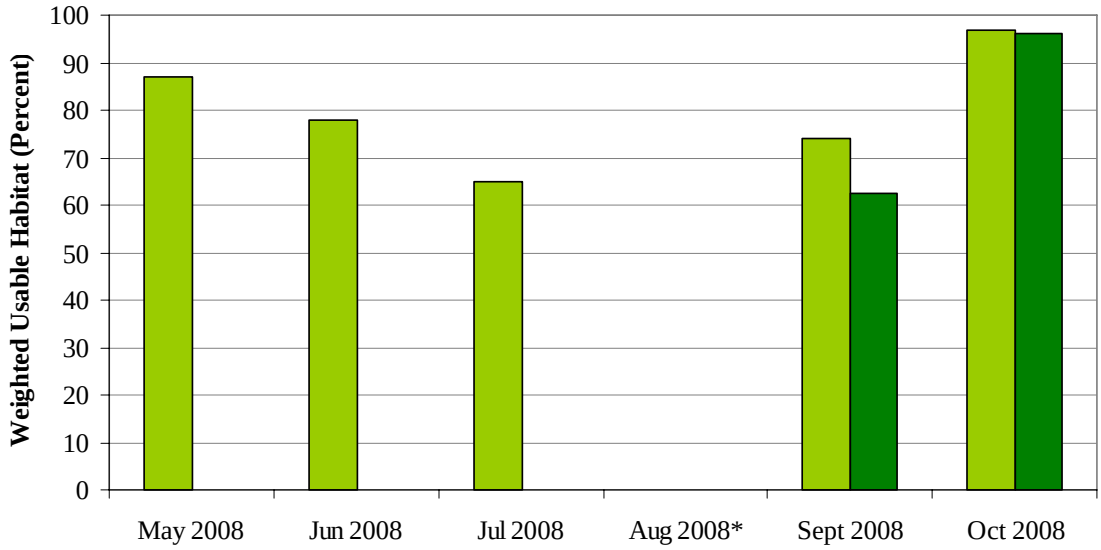


Figure 48. Percent weighted usable habitat for adult and spawning bull trout in the Upper Lemhi River below L-63 at mean monthly flows in 2008. *Flows in August were below the modeled range.

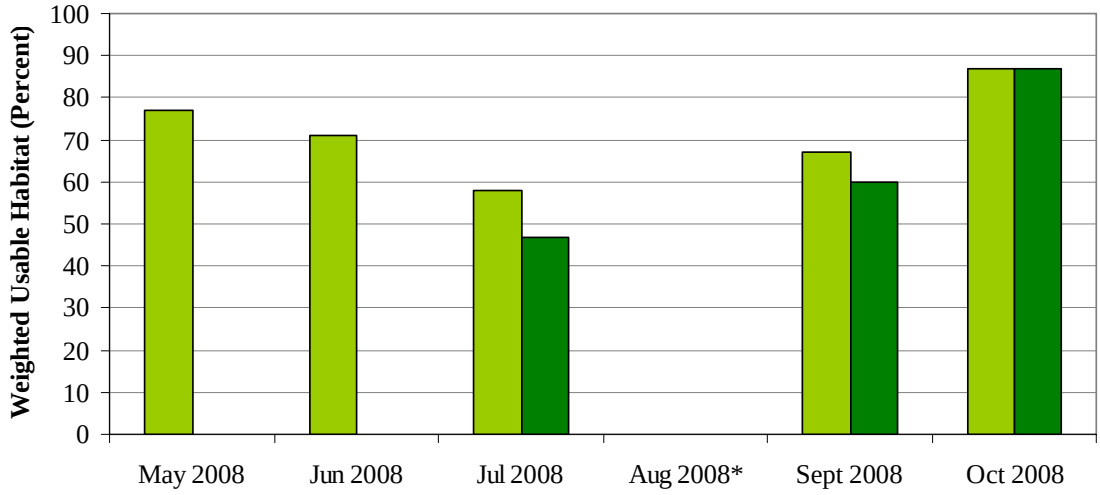


Figure 49. Percent weighted usable habitat for adult and spawning Chinook salmon in the Upper Lemhi River below L-63 at mean monthly flows in 2008. *Flows in August were below the modeled range.

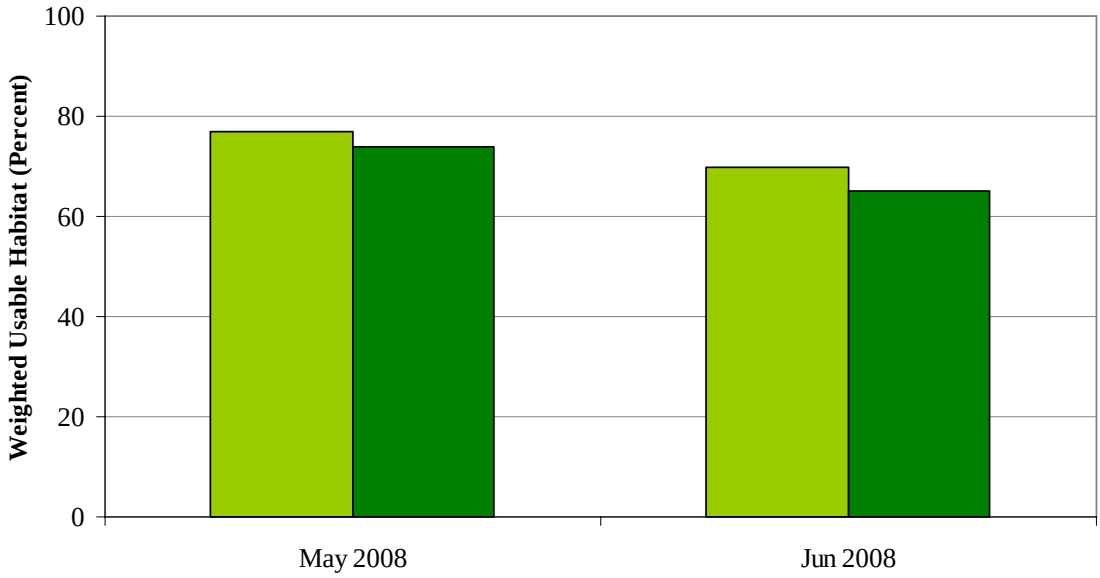


Figure 50. Percent weighted usable habitat for adult and spawning steelhead in the Upper Lemhi River below L-63 at mean monthly flows in 2008.

References

Curet, T. 2008. Fisheries Biologist. Idaho Fish and Game Screen Shop. Personal communication.

Lutch, J. 2006. Fishery Staff Biologist. Idaho Department of Fish and Game. Personal communication.

Maret, T.R., Hortness, J.E., and Ott, D.S. 2005. Instream flow characterization of Upper Salmon River Basin streams, central Idaho, 2004. USGS. Scientific Investigation Report 2005-5212.

Maret, T.R., Hortness, J.E., and Ott, D.S. 2003. Instream flow characterization of Upper Salmon River Basin streams, central Idaho, 2003. USGS. Scientific Investigation Report 2004-5173.

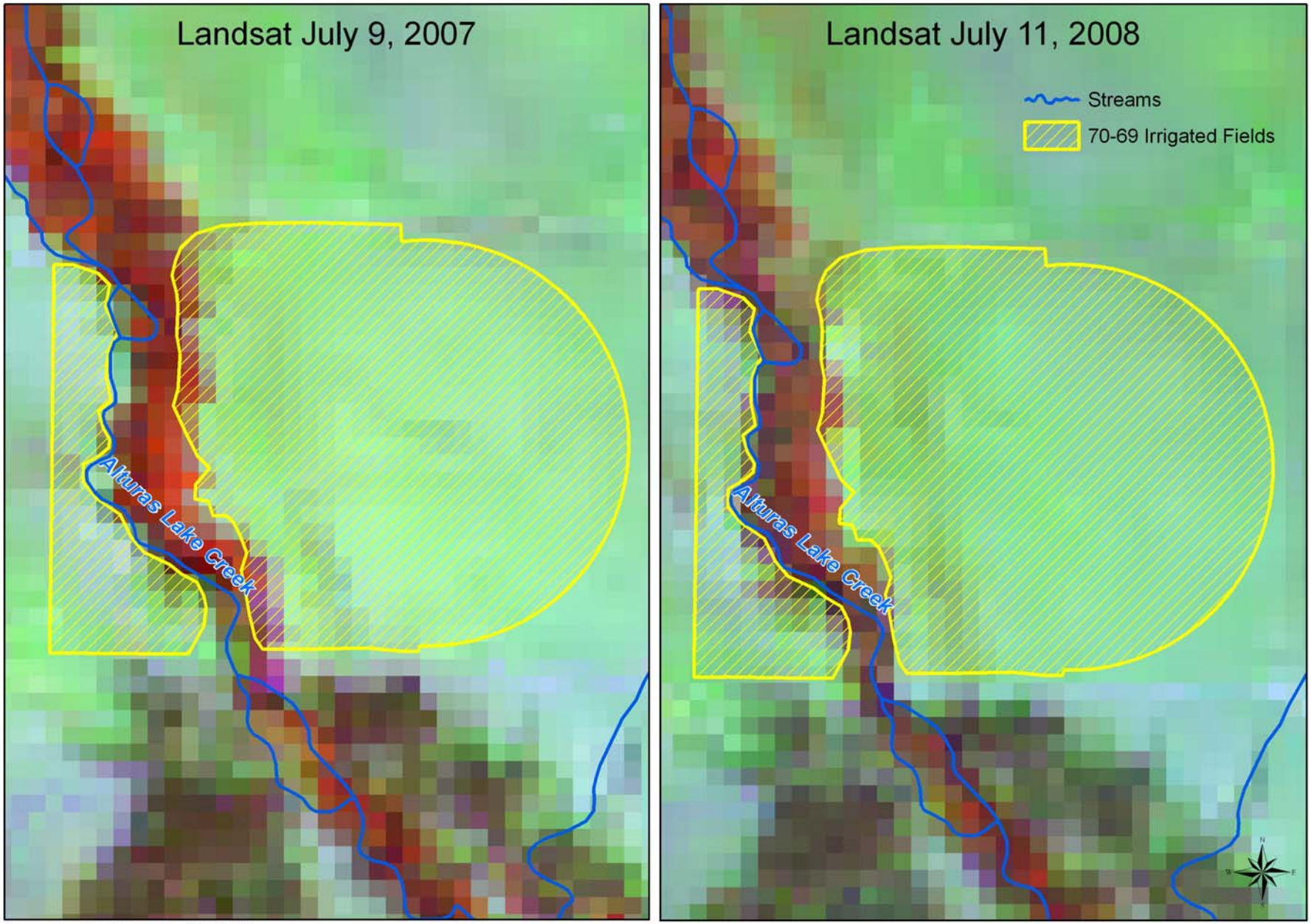
Morris, C. and R. Sutton. Instream Flow Assessment Hawley Creek and Eighteenmile Creek, Idaho. 2007. U.S. Department of the Interior, Bureau of Reclamation Snake River Area Office. Boise, Idaho.

Morris, C. and R. Sutton. Instream Flow Assessment Upper Lemhi River and Canyon Creek, Idaho. 2007. U.S. Department of the Interior, Bureau of Reclamation Snake River Area Office. Boise, Idaho.

Warren, Chuck. 2008. Fisheries Biologist. Idaho Department of Fish and Game. Personal communication.

Appendix A
Landsat Images

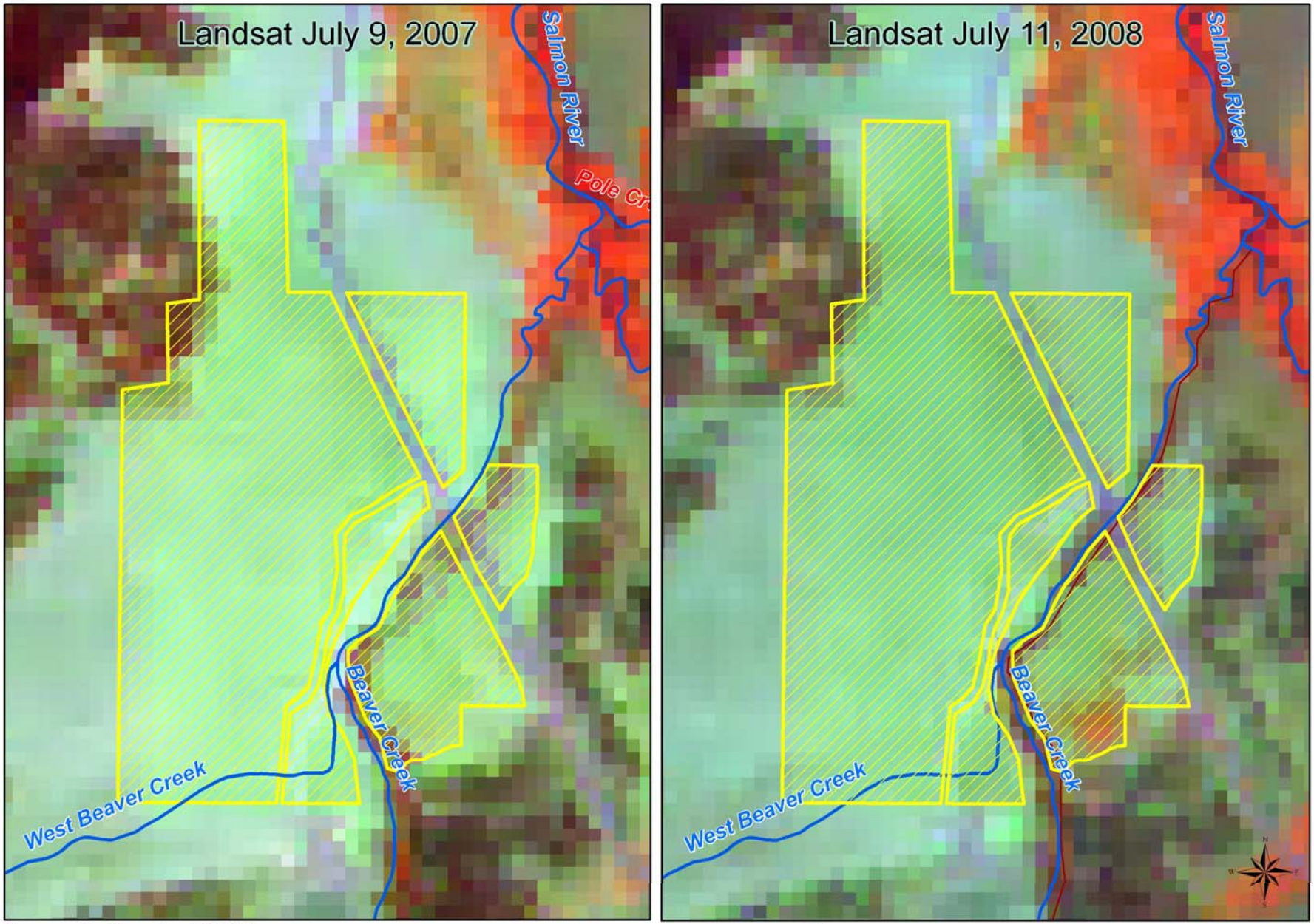
Alturas Lake Creek - Breckenridge Fields



Map prepared by Morgan Case 12/23/2008

0 0.05 0.1 0.2 0.3 0.4 Miles

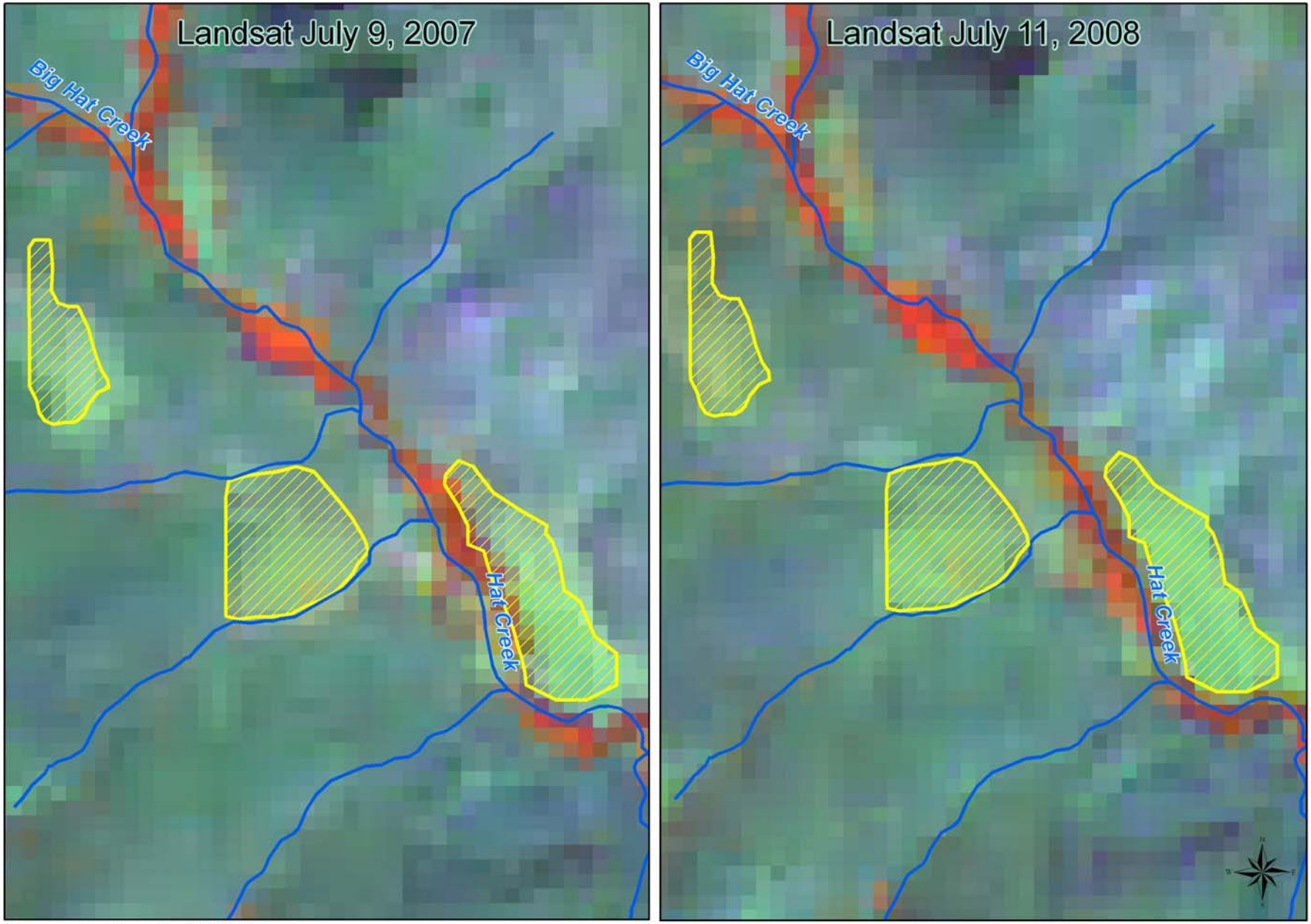
Beaver Creek - DOT LLC Fields



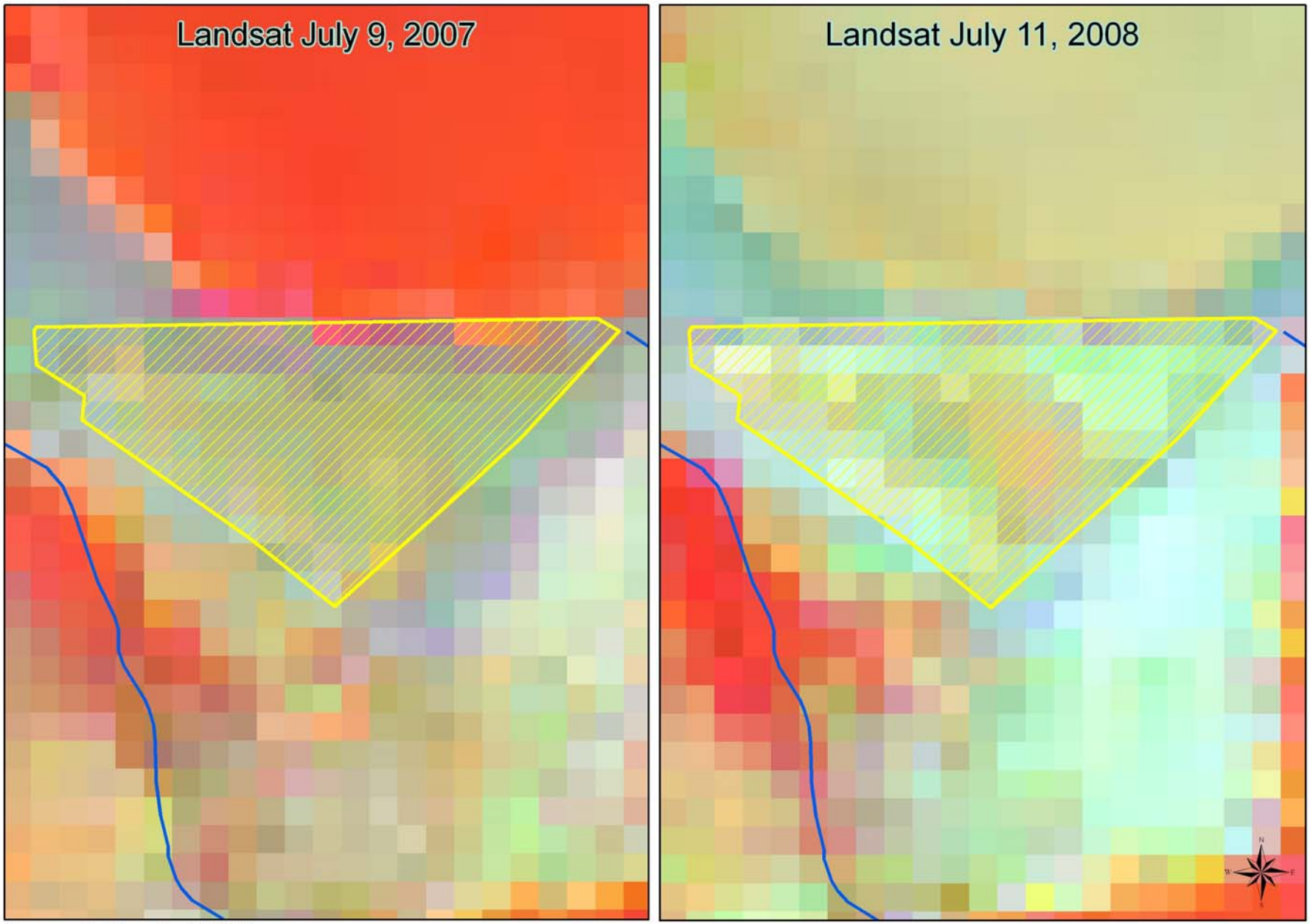
Map prepared by Morgan Case 12/23/2008

0 0.05 0.1 0.2 0.3 0.4 Miles

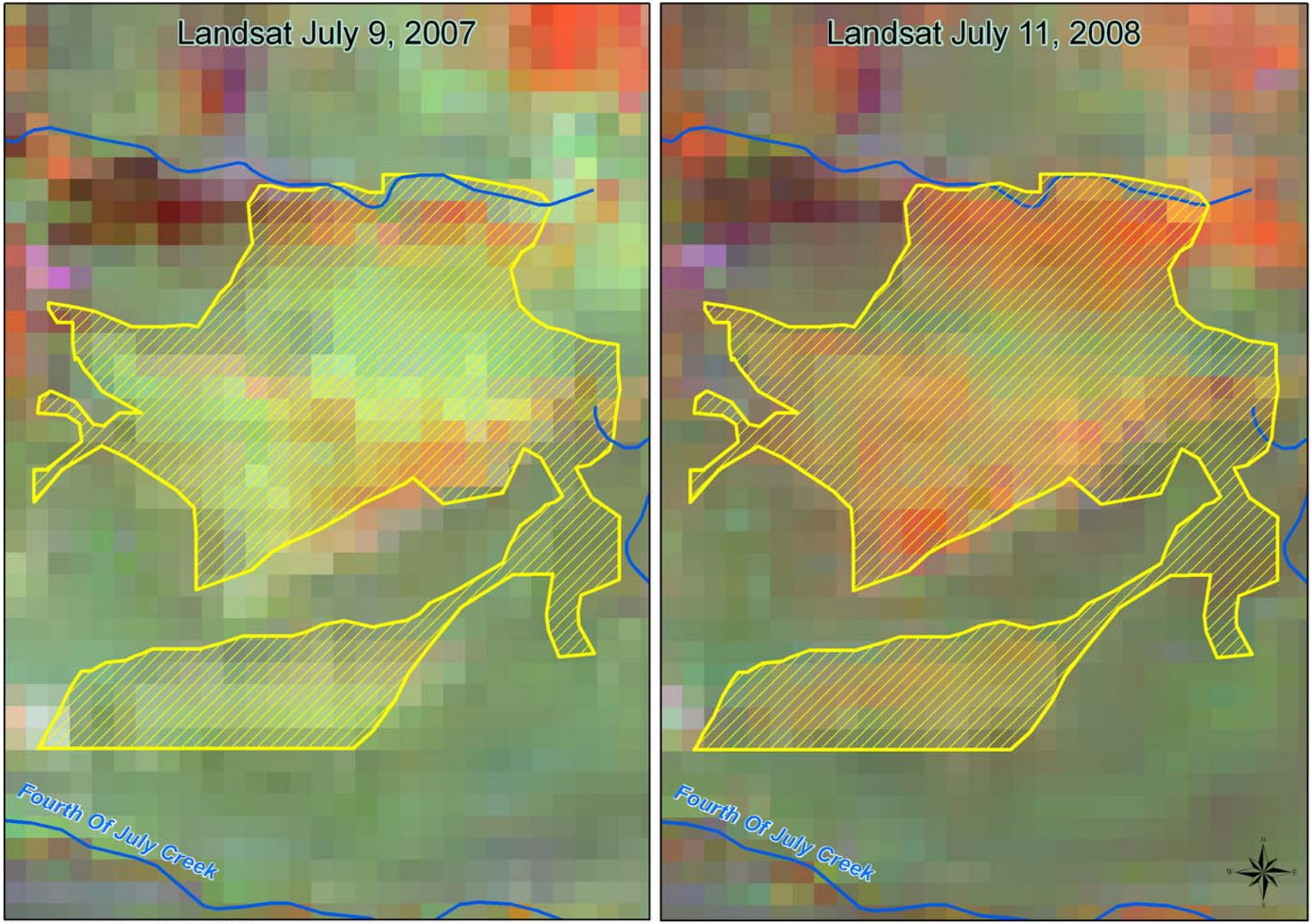
Big Hat Creek - Storlie/Kaiser Fields



Eighteenmile Creek - Ellsworth Fields



Fourth of July Creek - Vanderbilt Fields



Map prepared by Morgan Case 12/23/2008

Miles

0 0.030.06 0.12 0.18 0.24