MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
SALUDA HYDRO/COLUMBIA PROJECT RELICENSING
INTREAM FLOW/AQUATIC HABITAT TWC
IFIM Workshop

SCE&G's Lake Murray Training Center
January 23-25 2008

Final CSB 03-25-08

ATTENDEES:

Ron Ahle, SCDNR	Dick Christie, SCDNR
Gerrit Jobsis, American Rivers	Alan Stuart, Kleinschmidt Associates
Shane Boring, Kleinschmidt Associates	Kevin Nebiolo, Kleinschmidt Associates
Steve Summer, SCANA Services	Brandon Kulik, Kleinschmidt Associates
Jeni Hand, Kleinschmidt Associates	Hal Beard, SCDNR
Mike Waddell, Trout Unlimited	Matt Rice, American Rivers
Gerrit Jobsis, American Rivers	Amanda Hill, USFWS
Mark Giffin, SCDHEC	Randy Mahan, SCANA Services
Bill Argentieri, SCE&G	Scott Harder, SCDNR
Prescott Brownell, NMFS	Milton Quattlebaum, SCANA Services

NEXT MEETING

Tentatively set for March 20, 2008

MEETING NOTES:

These notes serve as a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

January 23, 2008

Shane Boring of Kleinschmidt Associates opened the meeting at approximately 9:30 am, and meeting attendees introduced themselves. Shane briefly reviewed action items that were listed in the previous IFIM meeting. Specifically, Shane asked Hal Beard of SCDNR if he had obtained information from Jason Bettinger regarding striped bass using the lower Saluda River (LSR) as a thermal refuge. Hal noted that he had obtained the information from Jason regarding the status of striper using the LSR as a thermal refuge during summer months (see Attachment A). Hal explained that this information focused on the receiver located at the Riverbanks Zoo. Hal explained that stripers were tagged at Gervais Street Bridge during spawning; both small and large fish were tagged. Temporal and diurnal data is not available at this time due to large data volume.

Kevin N. provided a brief explanation of the methodology used to develop the habitat duration analysis. He explained that WUA was weighted across each reach. Scott Harder noted that weighting factors for Toenail Rapids and Sandy Beach seemed to be out of proportion. Scott explained that Sandy Beach is a larger area than Toenail, but Toenail received a weighting factor approximately twice that used for Sandy Beach. Shane noted that he would check the reach lengths in GIS and adjust reach weighting accordingly.

Brandon K. then led a review of Leonard and Orth (1988[1]), which provides a framework for applying habitat guilds to instream flow analyses, and shows that the patterns in flow vs. habitat sutiability within guild types observed in this study match classic guild curve types. In the Saluda study, most of the lifestages used within a particular guild showed similar curve shapes, with inflections and peaks occurring at roughly similar flows. Brandon explained that as far as guilds are concerned, Leonard and Orth describe that for large rivers, focus should be on riffle, run and also stream margin, such as shallow slow, shallow fast and deep fast guild representatives. Brandon also pointed out that pool ("deep slow") guild members offer least decision information. Brandon further explained that the Leonard and Orth paper also point out that there are basically four WUA curve patterns or classifications, classes I, II and III are the most informative; conversely WUA curves corresponding to type IV are the least informative. Brandon proposed that the group consider these principals in guiding guild choices. He added that the group should possibly consider eliminating various type IV and deep-slow curves, there may even be an opportunity to blend or eliminate a few species and lifestages with redundant curve shapes. Brandon noted that if committee members are comfortable with developing blended curves for each guild, then we would be able to reduce the volume and complexity of WUA curves for purposes of decision-making. Ron Ahle noted that he was concerned that if we blend species together then, we may lose sensitivity of each life stage. For example, he noted that when a brown trout fry becomes a juvenile, the requirements may change. After additional discussion, the group determined that the methodology was acceptable, because as flow targets driven by blended guilds are considered, effects on individual lifestages can still be viewed and adjustments made as necessary.

The group decided that the best way to use the data was in an interactive table depicting flow and percent WUA for each month. Agency staff noted that a similar tool had been developed during the Catawba-Wateree relicensing to develop minimum flows. The group determined the following blended guilds and key species with lifestages were to be used in the interactive table developed for the following day's meeting.

[1] Leonard, Paul M. And Donald J. Orth. 1988. Use of Habitat Guilds of Fishes to Determine Instream Flow Requirements. *North American Journal of Fisheries Management* 8:399-409.

Species/Guild	Lifestage/Curve	Priority
Brown Trout	Adult	K
	Juvenile	K
	Fry	S
	Spawning	S
Rainbow Trout	Adult	K
	Juvenile	K
	Fry	S
	Spawn	S
Smallmouth Bass	Adult	K
	Juvenile	K
	Fry	S
	Spawning	S
Shortnose Sturgeon	Spawning	S
	YOY	S
Striped Bass	Adult	K_1
Deep-slow Guild	Blended	S
Deep-fast	Blended	K
Shallow-slow	Blended	K
Shallow-fast	Blended	K

K=Key Species; S=Secondary
K_1=Striped bass identified as key species primarily for zone-of-passage and thermal refuge

January 24, 2008

Shane Boring opened the meeting at approximately 9:30 am with a number of housekeeping items. First, an updated version of the dual flow analysis was distributed to attendees; it was noted that the figures 4.2, 5.2, and 5.5 needed to be updated to reflect the ½ unit flow increments previously requested. Kevin Nebiolo noted that these were not updated due to inconsistencies between the graphed and modeled results. Kevin added that he would rerun the regressions for these sites and update the tables ASAP. An updated version of the dual flow analysis was also distributed to attendees.

Scott Harder enquired as to whether the inconstancies pointed out during the previous day regarding reach weighting used in the habitat duration analyses had been addressed. Specifically, Scott reminded the group that, based in his interpretation of proportions of various habitats from the mesohabitat assessment, it appeared that the weighting scheme used in the current analysis resulted in the Toenail Rapids areas being over-represented and the Sandy Beach areas under-represented. Shane noted that he had re-calculated the reach lengths for these sites using ArcGIS and that Scott was correct; he added that the reach weighting and habitat duration analyses had been updated accordingly.

Brandon Kulik recapped the previous day's accomplishments, noting that the group had agreed on "key" and "secondary" species/lifestages. He added that this was done in an effort to further streamline WUA output produced thus far in the IFIM process and to begin honing in on those species/lifestages that will ultimately be "drivers" in the flow negotiations. He added that the focus of today's discussion would be to use the interactive spreadsheet developed by Kevin N. to examine various flow scenarios, adding that the most expeditious method would be to focus on the "key" species/lifestages and use the "secondary" species as a "sanity check."

The group then engaged in an interaction session using the spreadsheet developed by Kevin N. (example included in Attachment B). The group began discussions with a year-round flow of 700 cfs. Dick Christie requested that a flow of approximately 1200 cfs be evaluated for the spring months to allow passage of striped bass that utilize the LSR for thermal refuge. Alan S. enquired as to whether an earlier recommendation of using pulsing rather than continuous flows would be feasible for providing the passage flows needed for striped bass. Hal B. noted that there is typically a very short, temperature dependant window during which the majority of striped bass migrate into the LSR, and as such, having very short, pulsed flows has a greater potential for missing the window for inmigrating fish. Gerrit noted that a low flow protocol is likely needed and that a pulsed flow could be a possibility during these low flow years.

Brandon Kulik recommended going month-by-month through the interactive spreadsheet to examine the proportion of optimal WUA provided at various flow for the key species/lifestages. Dick C. added that looking at seasonality of the key and secondary species, as well as those identified as SCDNR management priority species, would be beneficial for this exercise. As a result the group developed the following seasonality:

Key Species/Month	J	F	M	A	M	J	J	A	S	O	N	D
Adult trout												
Juvenile trout												
Brown trout spawn/fry												
Rainbow trout spawn/fry												
Striped bass passage												
Striped bass thermal refuge												
Smallmouth bass spawning												
Smallmouth bass juveniles												
Shallow-slow guild												
Shallow-fast guild												
Deep-fast guild												

After considering a number of scenarios, the group agreed on the following proposed flow regime:

Month	Minimum Flow Recommendation (cfs)
January 1 – March 31	700
April 1 – April 14	1000
April 15 – May 14	1300
May 15 – May 31	1000
June 1 – December 31	700

Brandon K. noted that, according to the model, the flows being proposed should provide close to 100% of maximum WUA for most target species/lifestages (See spreadsheet result in Attachment B). He reminded the group that, in previous TWC discussions, flows providing 80% of optimal WUA had been deemed acceptable. After consulting the flow duration curves to ensure that sufficient water would likely be available, the group agreed to leave the recommended flows at the near 100% of optimum WUA levels. It was agreed that this would allow room for adjustment should the operations modeling indicate potential conflicts with other water uses.

In closing, the group agreed that the final day of workshop would focus on development of low and high inflow protocols to augment the flows recommended above for normal water years. The session adjourned at approximately 3:45 pm.

January 25, 2008

Shane Boring opened the session at approximately 9:30 am, noting that a set of preliminary flow recommendations had been developed the previous day. He added that today's session would focus on development of high and low inflow protocols.

The group first discussed a low inflow protocol. Noting that the group had previously agreed that 80% of maximum WUA was acceptable for most species, Shane enquired as to whether attendees had species target numbers in mind. Alan S. noted that had consulted the SC State Water Plan, as promised during the previous day's session, and confirmed his assertion of 475 cfs as the minimum navigation flow for the LSR. Alan added that a flow of 400 – 500 cfs during low inflow years would provide at least 80% of maximum WUA for most species/guilds and recommended 400 cfs as a starting point for negotiations. Dick C. recommended that a staged approach linked to the severity of the drought would be appropriate, adding that this was the approach taken for Catawba-Wateree. Dick added that linking to the state's official classification would allow the burden of usage restrictions to be shared with other water users in the state (i.e. municipalities, etc.).

The group then discussed potential impacts of reduced flow during low flow years on water temperature. Gerrit pointed that temperatures below 20° C are generally preferred for optimal trout growth. Hal Beard added that maintenance of suitable conditions for trout is among SCNDR's management goals for the LSR and reiterated the need for temperatures less than 20° C. The group then examined temperature data from the USGS data at Riverbanks Zoo and from SCE&G's relicensing study. Shane pointed out that during the period of May 1 – September 30, 2007, the maximum temperature observed during SCE&G's study was 22° C, adding that this is below the thermal lethal limits for trout. Kevin noted that, based on the Riverbanks Zoo USGS data from 2006 and 2007, the highest temperature was 23.9° C on August 23, 2006 with a flow of 483 cfs. Attendees acknowledged that it may be necessary under low flow conditions to pulse the project periodically to push temperatures back below 20° C.

Kevin then led an interactive session examining the % of maximum WUA provided for target species at the recommended 400 cfs low inflow protocol. Alan noted that at 400 cfs 80% WUA was met or nearly met for all species, with adult smallmouth bass taking the biggest hit. The Group agreed that 400 cfs appeared reasonable during most months. Bill enquired as to whether higher flows would be needed for fish passage during low inflow years. Gerrit and Ron recommended ratcheting down the passage flows depending on the severity of the drought. It was noted that, during more severe droughts, some passage could be provided through pulses. The group agreed that the SCDNR striped bass movement data and the rate-of-change study would likely need to be examined to estimate the magnitude, timing, and during needed for pulses to be effective. After additional discussion, the group agreed on the following recommended low inflow protocol:

SC Drought Stage	Normal	I	II	III	IV
Jan 1 – March 31	700	700	700	400	400
April 1- 14	1000	700	700	400	400
April 15-May 14	1300	1300 pulse	700	400 pulse	400
May 15 – May 31	1000	700	700	400	400
June 1 – Dec 31	700	700	700	400	400

Shane then distributed and the group briefly discussed the updated dual flow analysis (Attachment C). It was noted that all analyses had been reformatted to ½ unit flow increments, as requested, and that macroinvertebrates had been added to the analyses. Several group member asked to be reminded of the purpose of having the dual flow analysis considering the assumption that dual flow analyses are typically only applicable to peaking projects. Shane noted that group members had voiced concern about the length of the proposed FERC license for the Project and had requested the dual flow in the event that the operating scenario is changed sometime during the license term. The group agreed that the analysis seemed adequate. Shane noted that the analysis would be attached to the meeting notes in order to make it part of the record.

The group then worked towards developing a proposed high flow protocol. Gerrit noted that he would like to see excess water during high flow periods used to enhance the habitat in the Oh Brother/Ocean Blvd area, adding that releases during high flows years could help offset lower flow years. Gerrit added that releasing excess water during high flow years would also be more consistent with a natural hydrograph. Brandon enquired as to what the flow limitations were for wade fishing in this area. Alan and Mike Waddell noted that was generally agreed among fishermen to be around 1000 cfs. After additional discussion, the group reached consensus on the following proposed high flow protocol:

- If reservoir is at full summer pool elevation on March 1, begin releasing the 1000 cfs on March 1 rather than April 1. This early release would last as long as the water level was above the target elevation during a normal inflow year. Once the water level dropped below the target elevation the increased flows would be suspended.

It was noted that proposed low and high inflow protocols would be forwarded to the operations modeling group to evaluate potential conflicts with other water needs (i.e. lake level maintenance, downstream recreation flows, etc.). The meeting closed at approximately 3:30 pm.

ATTACHMENT A

LSR Striped Bass Movement Information from SCDNR

Hal Beard

From: Jason Bettinger
Sent: Tuesday, January 15, 2008 3:01 PM
To: Hal Beard
Cc: 'Alan Stuart (E-mail)'; Dick Christie; Ron Ahle; Jim Bulak
Subject: RE: LSR STB info

Hal, below are answers to some of your questions. As you noted we have not completed the study, and cannot address a few of your questions at this time.

- Fifty-eight percent of fish that were tagged in the Congaree River during spring 2006 entered the lower Saluda River, where they spent the majority of the summer. During spring 2007 21 of 39 (54%) instrumented fish entered the lower Saluda River. Eighteen of those 21 fish used the Saluda River during 2006 and 2007.
- Striped bass that used the Saluda River (Mean TL = 758 mm, range 675 - 930 mm) were significantly larger than striped bass that did not use the lower Saluda River (Mean TL = 685 mm, range = 610 - 775 mm).
- During 2006 striped bass (N=14) entered the Saluda River between 21 April and 30 May (median entry date = 9 May) those fish departed the Saluda River between 13 July and 7 November (median departure date = 25 September). During 2007 striped bass (N=21) entered the Saluda River between 22 April and 31 May (median entry date = 4 May), transmitters expired before departure date could be determined. We have not yet evaluated movements based on flows, but the potential to evaluate that relationship may exist.
- The bulk of striped bass leave the Saluda River during the late summer, but at this point I couldn't say whether or not there is a significant relationship between draw down releases and striped bass departures.

If you have other questions let me know.
Jason

From: Hal Beard
Sent: Thursday, January 03, 2008 10:04 AM
To: Jason Bettinger
Cc: Alan Stuart (E-mail); Dick Christie; Ron Ahle; Jim Bulak
Subject: LSR STB info

Jason,
I spoke with you several weeks ago regarding several aspects of the STB telemetry study as it relates to their movement into and out of the LSR. As part of the Saluda Dam relicensing process, the Instream Flow Committee has been working at establishing flow recommendations for this tail water, with a focus on the fishery resource. One of the stand alone species being considered is STB. A number of questions were posed during our discussions of those habitat (flow) requirements needed for spring passage into the system, as well as that needed to maintain favorable summer habitat. We thought it may be helpful if you could share any of your study results that may help answer some of these questions.

- What percentage of the "tagged" fish entered the lower Saluda in each of the past two years of the study?
- Is there any indication that a particular size fish was more prone to enter the system or in general did both larger and smaller fish do so? What size ranges were involved?
- Based on the data, can the apparent temporal component associated with their movement in or out of the river be defined and how accurately? Specifically, when was the onset of spring migration into the lower portion (zoo receiver) and can any peak periods of movement be correlated to instantaneous flows or diurnal response?

- Is there any indication their movement out of the system is in response to "draw down" releases that begin in the late summer?

It is acknowledged that the study is not complete and the data thus far may not be adequate to definitively answer some of these questions but any input you could provide would be much appreciated.

Alan you can forward this to anyone else on the committee you deem appropriate, I just didn't have the e-mail address of all of the individuals and didn't want to exclude anyone.

ATTACHMENT B

LSR Interactive Flow/Weighted Usable Area Spreadsheet

Saluda Instream Flow Optimization Interactive Table

		Adult Brown Trout		Juvenile Brown Trout		Adult Rainbow Trout		Juvenile Rainbow Trout		Adult Smallmouth Bass		Juvenile Smallmouth Bass		Sturgeon	
		WUA	%	WUA	%	WUA	%	WUA	%	WUA	%	WUA	%	WUA	%
700	January	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	February	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	March	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
1000	April 1-14	2294953.76	85%	2611724.96	90%	6518521.63	99%	2993725.12	95%	3937174.42	88%	2278588.84	95%	2348958.64	57%
1300	April 15 - May	2071130.20352	77%	2212491.66062	76%	6586126.89091	100%	2747752.69468	87%	4278359.00554	96%	2025338.19148	84%	2781983.40838	67%
1000	May 15 -30	2294953.76	85%	2611724.96	90%	6518521.63	99%	2993725.12	95%	3937174.42	88%	2278588.84	95%	2348958.64	57%
700	June	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	July	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	August	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	September	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	October	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	November	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
700	December	2684951.58715	100%	2898849.75994	100%	6228705.6496	94%	3136454.96344	100%	3396836.0802	76%	2368171.31854	99%	1946514.0476	47%
400	Min Flow	2225202.4168	83%	2826330.79504	97%	5364432.1168	81%	3038911.76464	97%	2568267.2256	58%	1823679.00928	76%	1160859.8648	28%
0															

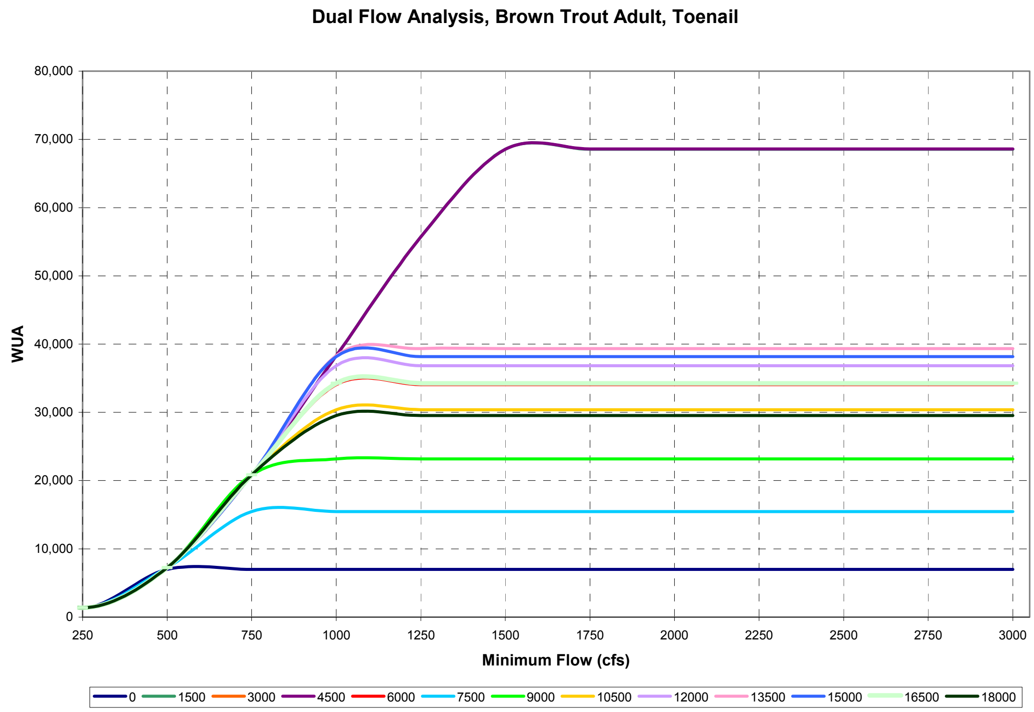
ATTACHMENT C
Final LSR Dual Flow Analysis

Attachment 1
Dual Flow Analysis List of Figures

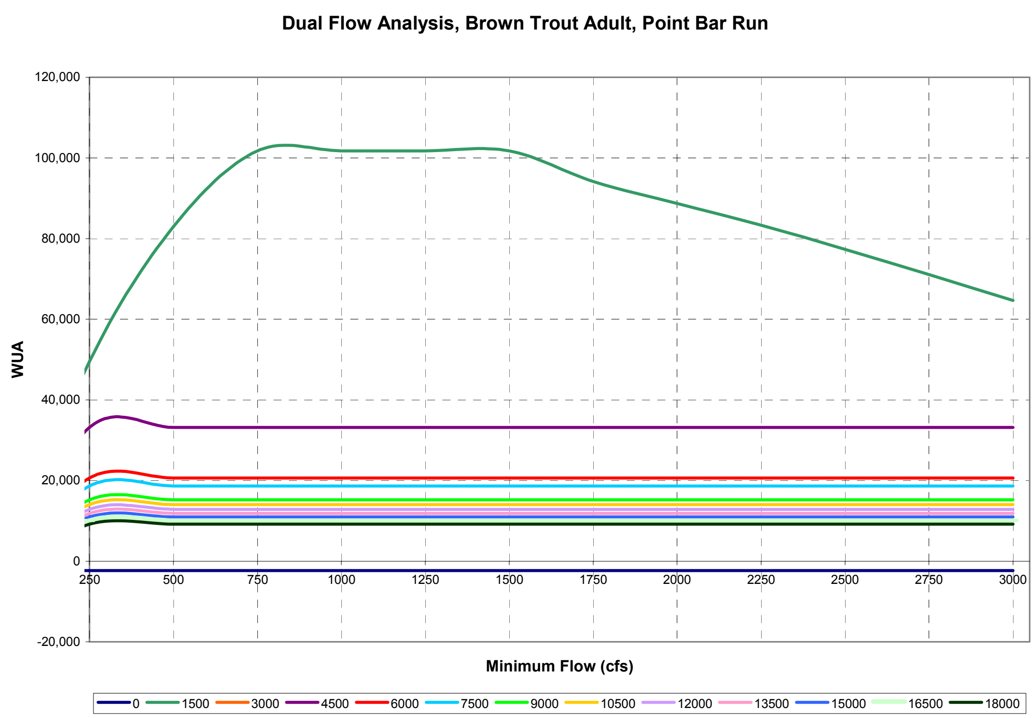
Attachment 1 Dual Flow Analysis

The graphs are contained within the attachment, if you wish to view each graph's corresponding Dual Flow Matrix table please refer Attachment 1A, Dual Flow Tabular Results.

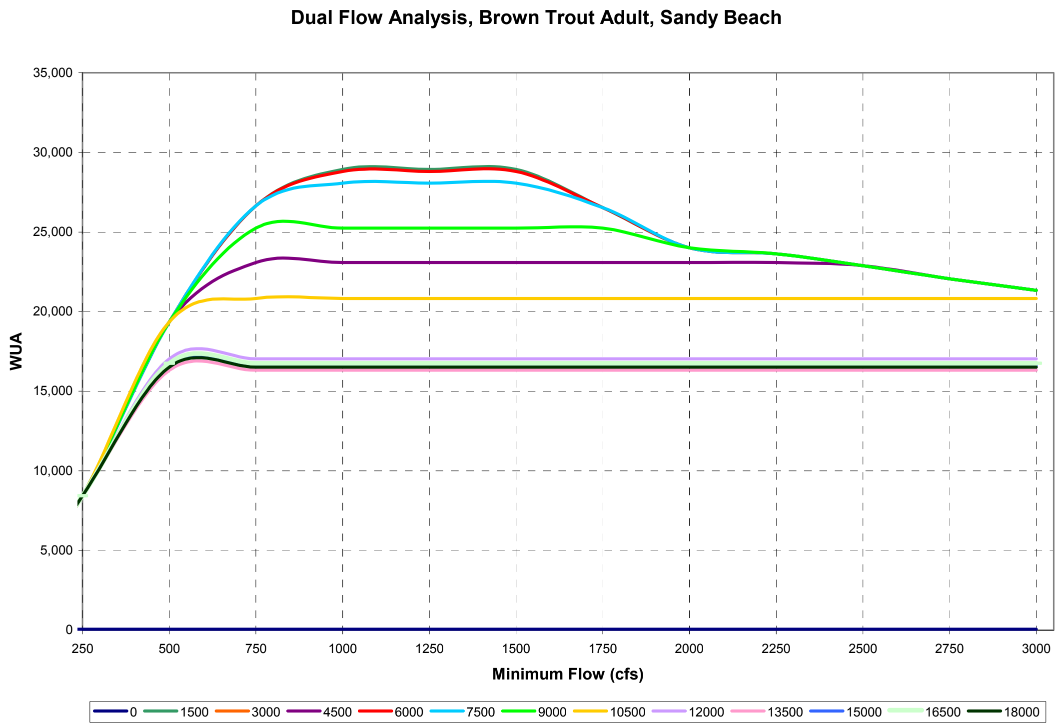
1. Brown Trout Adult



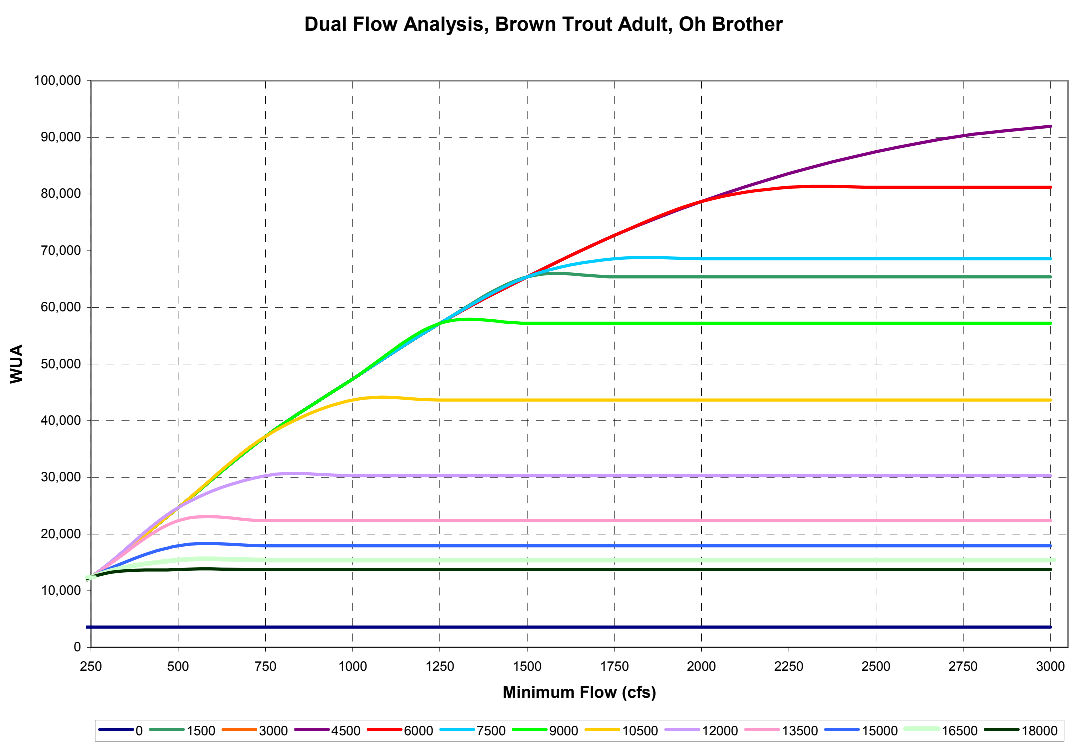
1.1. Dual Flow Analysis Brown Trout Adult at Toenail Riffle



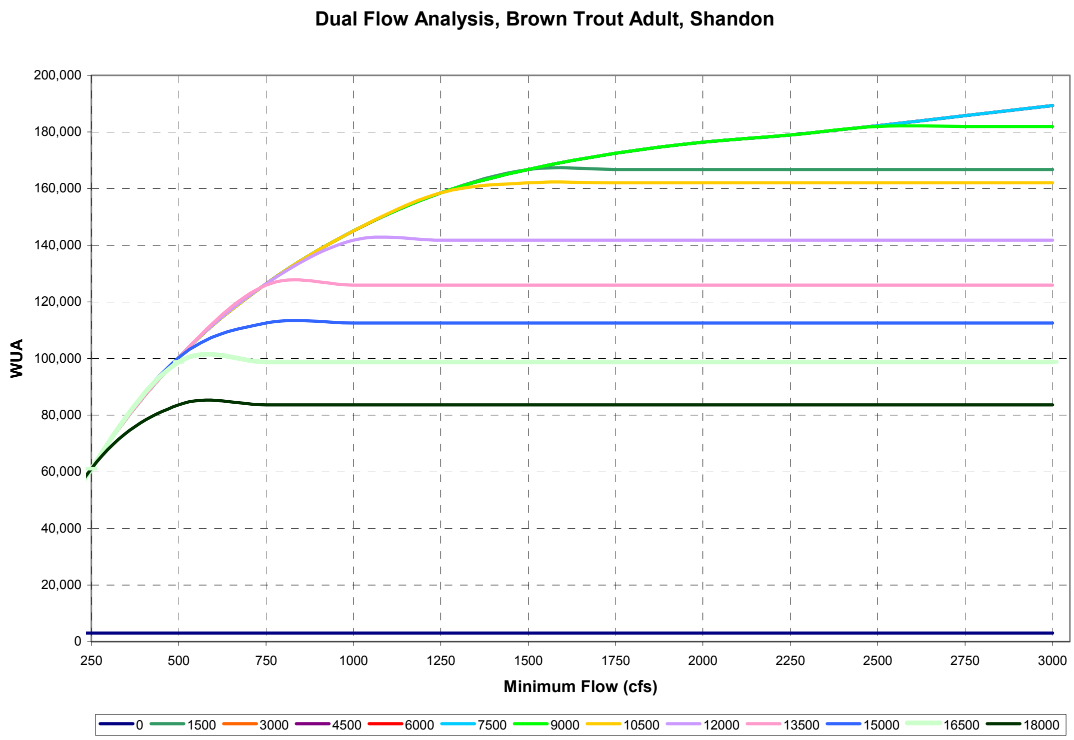
1.2. Dual Flow Analysis Brown Trout Adult at Point Bar Run



1.3. Dual Flow Analysis Brown Trout Adult at Sandy Beach

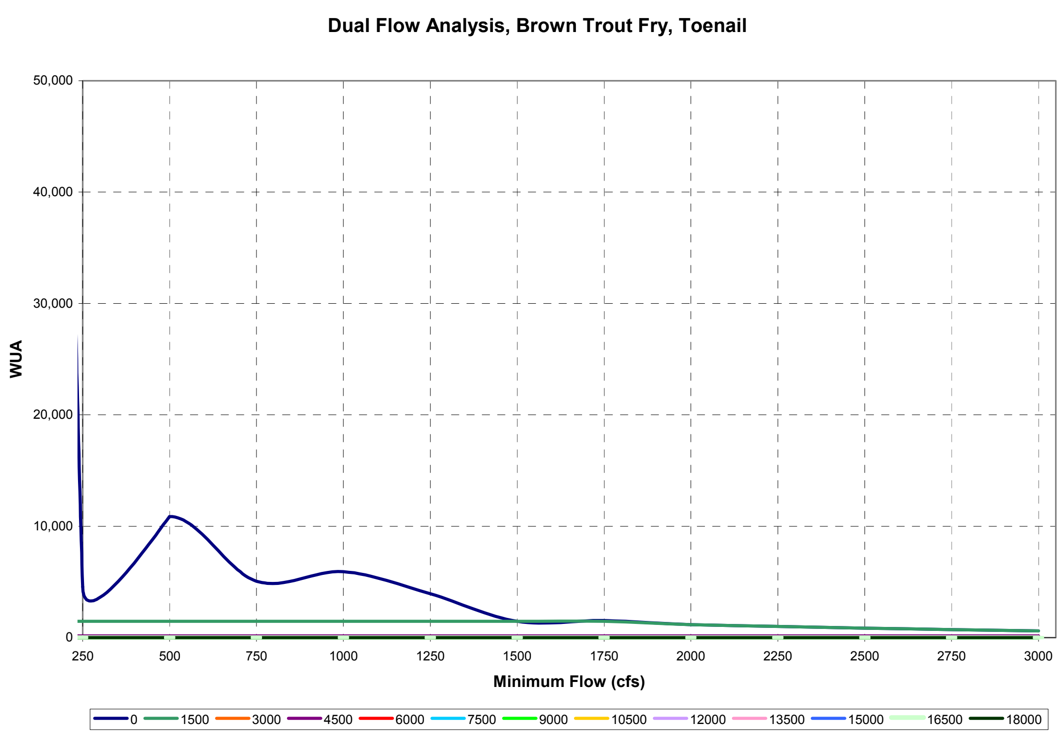


1.4. Dual Flow Analysis Brown Trout Adult at Ocean Blvd/Oh Brothers Rapids

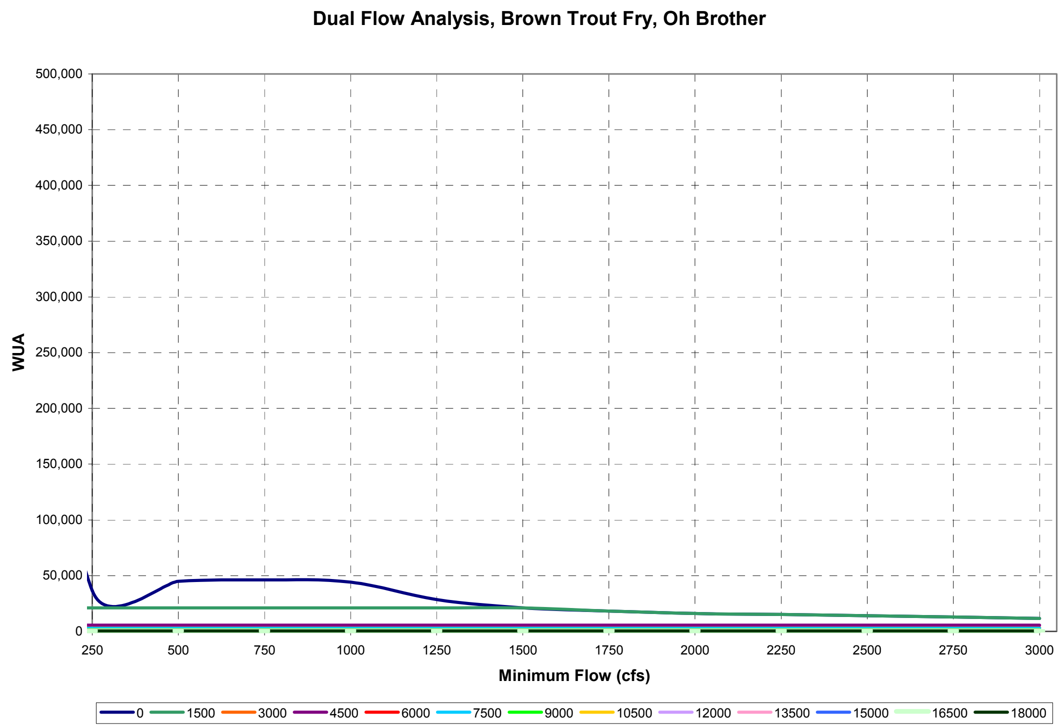


1.5. Dual Flow Analysis Brown Trout Adult at Shandon

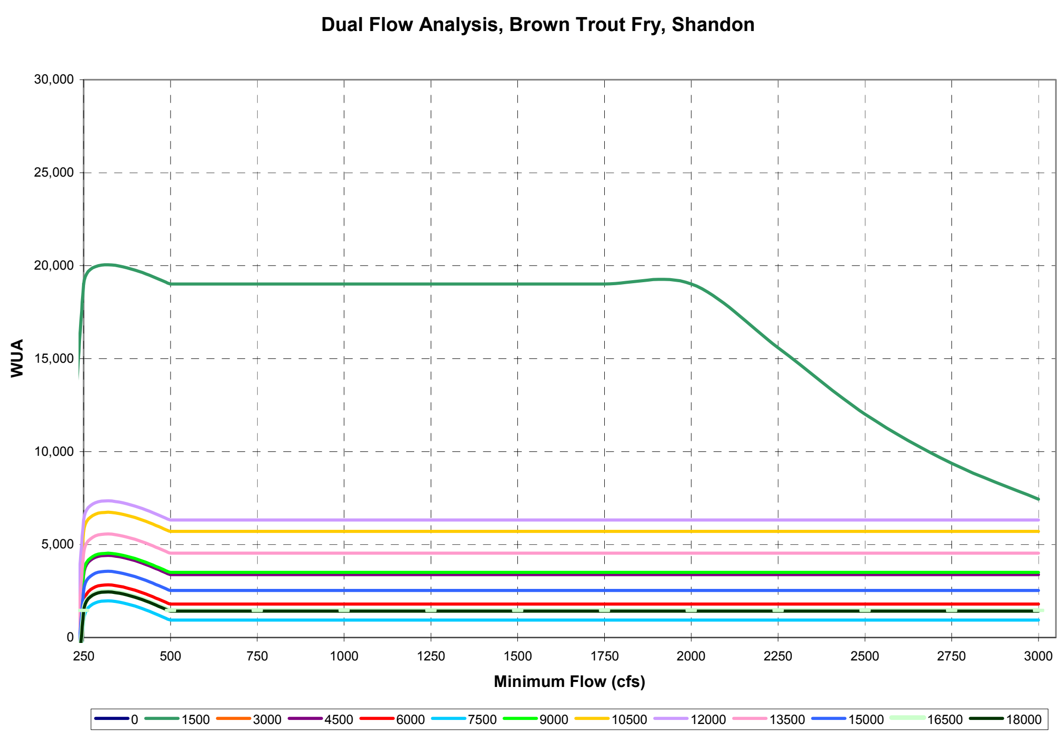
2. Brown Trout Fry



2.1. Dual Flow Analysis Brown Trout Fry at Toenail Riffle

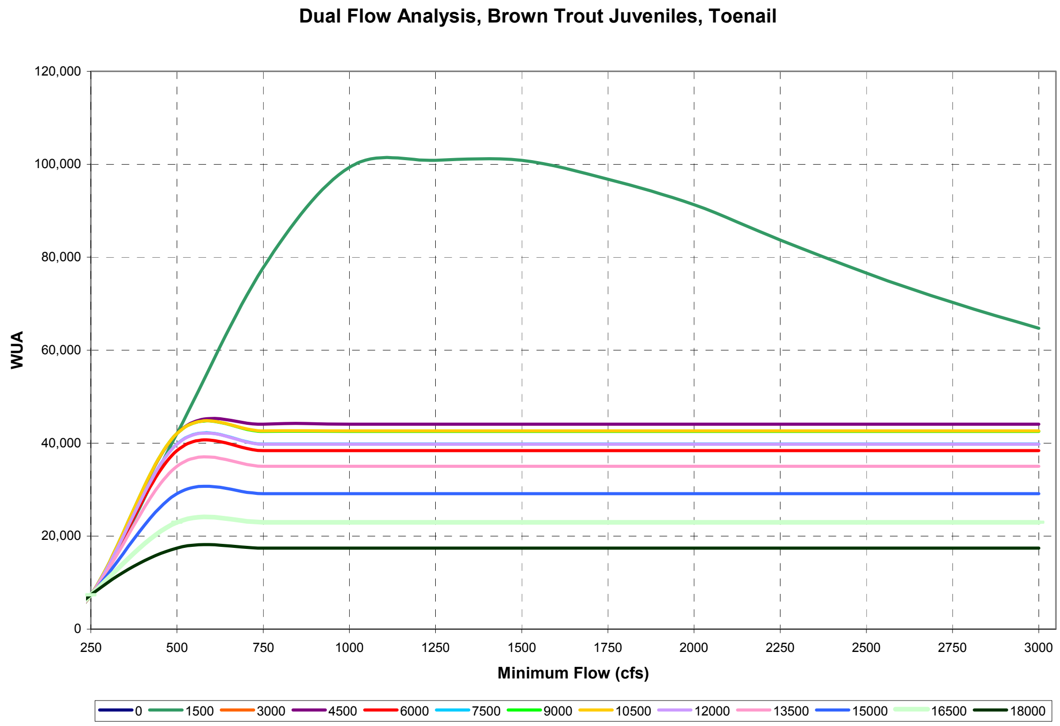


2.2. Dual Flow Analysis Brown Trout Fry at Ocean Blvd/Oh Brother Rapids

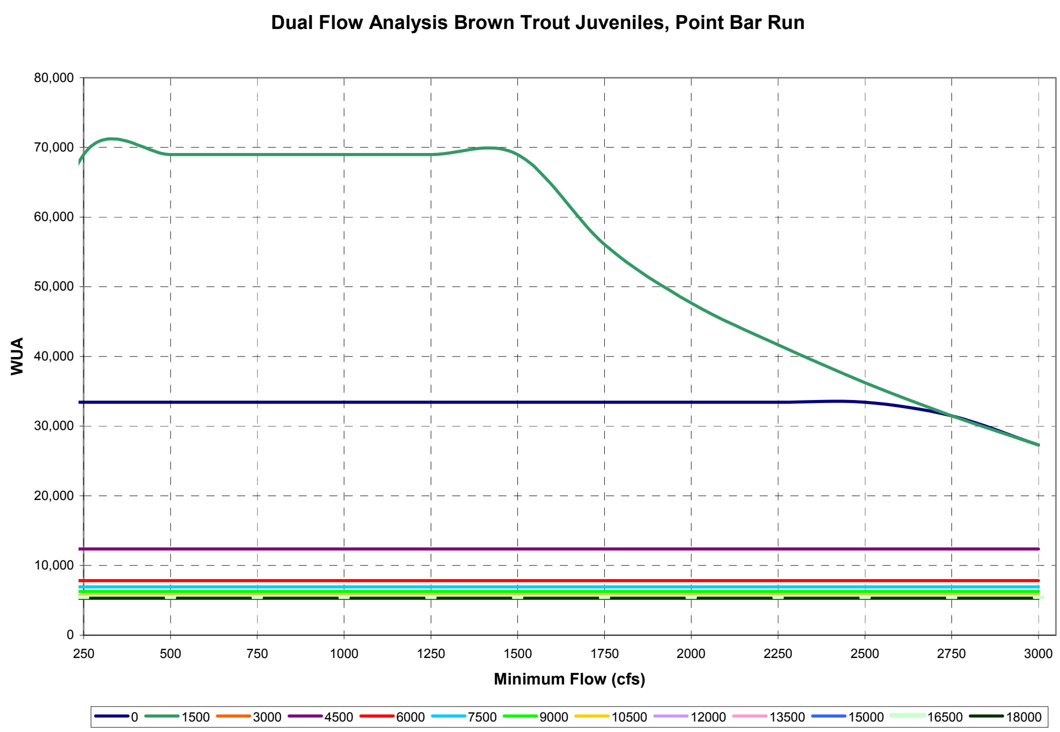


2.3. Dual Flow Analysis Brown Trout Fry at Shandon

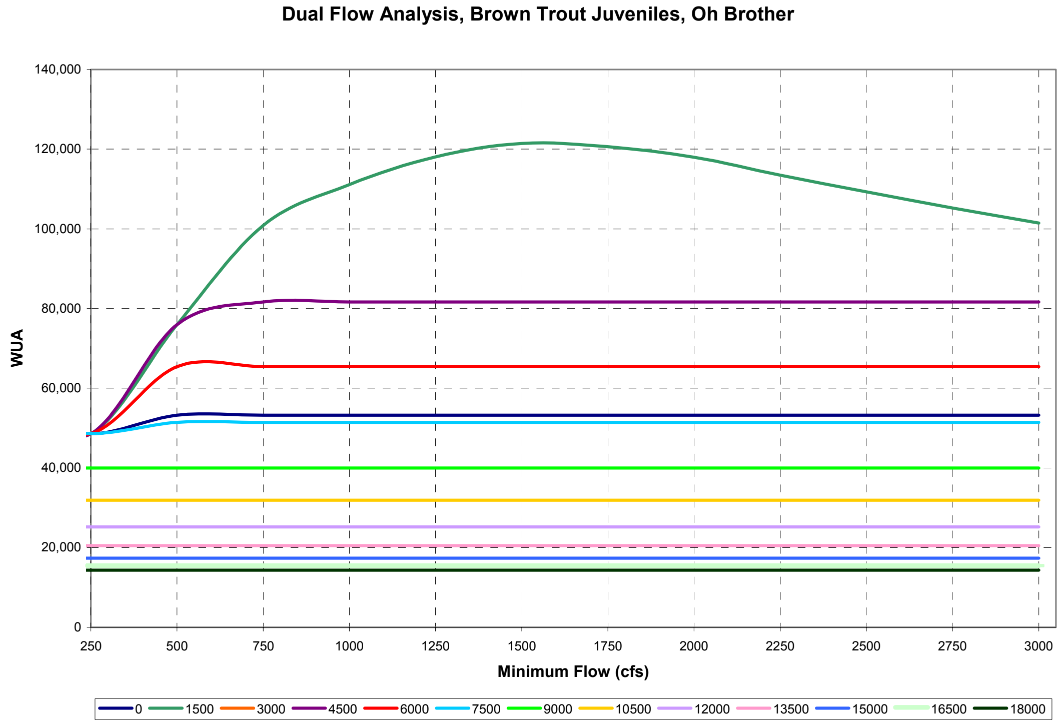
3. Brown Trout Juvenile



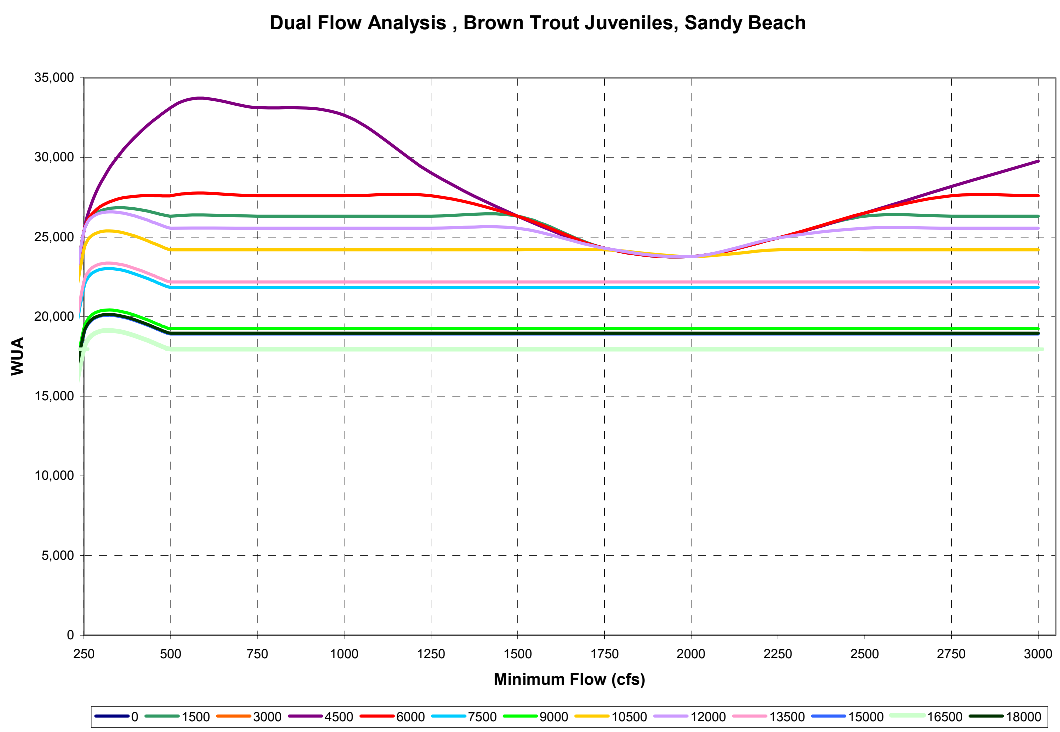
3.1. Dual Flow Analysis Brown Trout Juvenile at Toenail Riffle



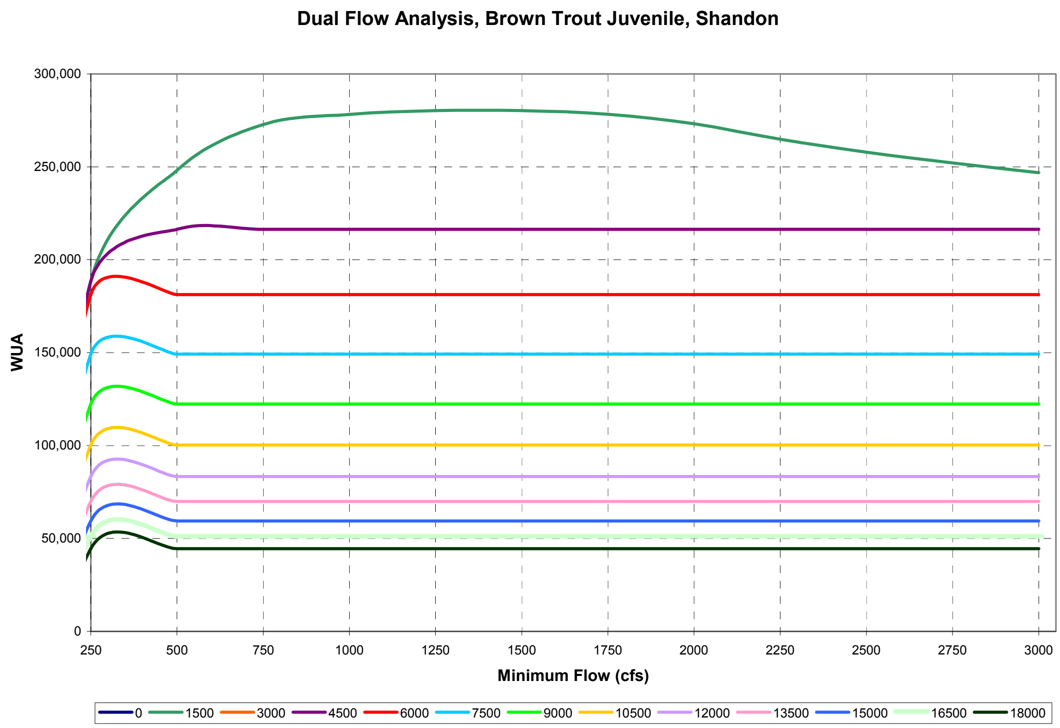
3.2. Dual Flow Analysis Brown Trout Juvenile at Point Bar Run



3.3. Dual Flow Analysis Brown Trout Juvenile at Ocean Blvd/Oh Brother Rapids

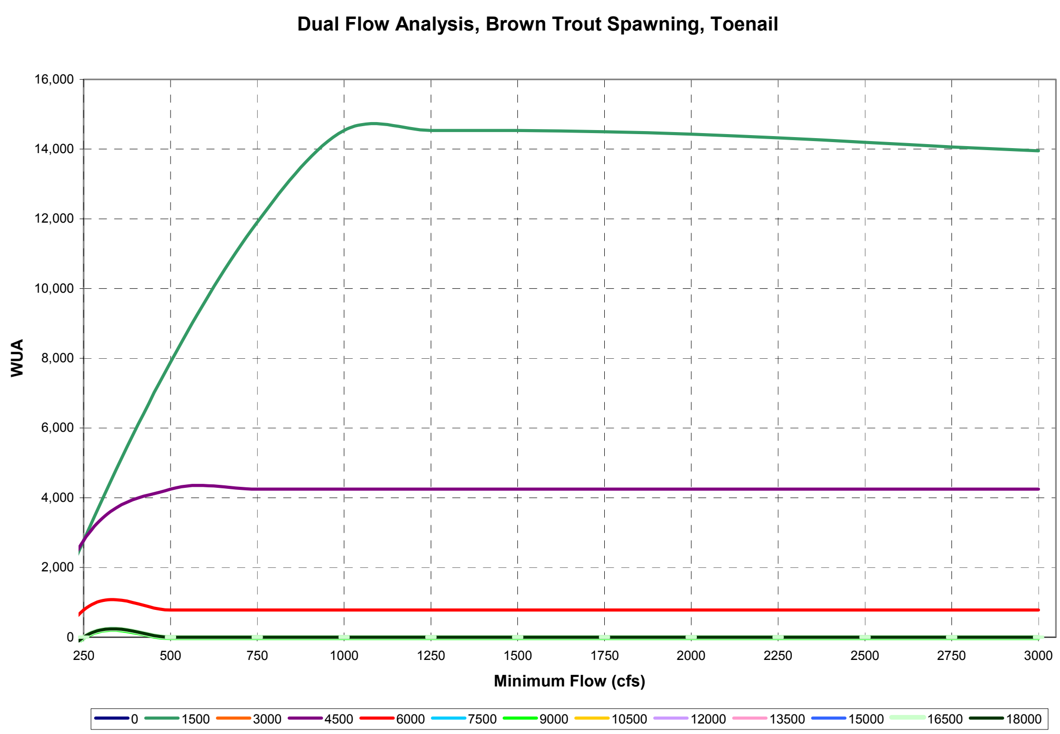


3.4. Dual Flow Analysis Brown Trout Juvenile at Sandy Beach



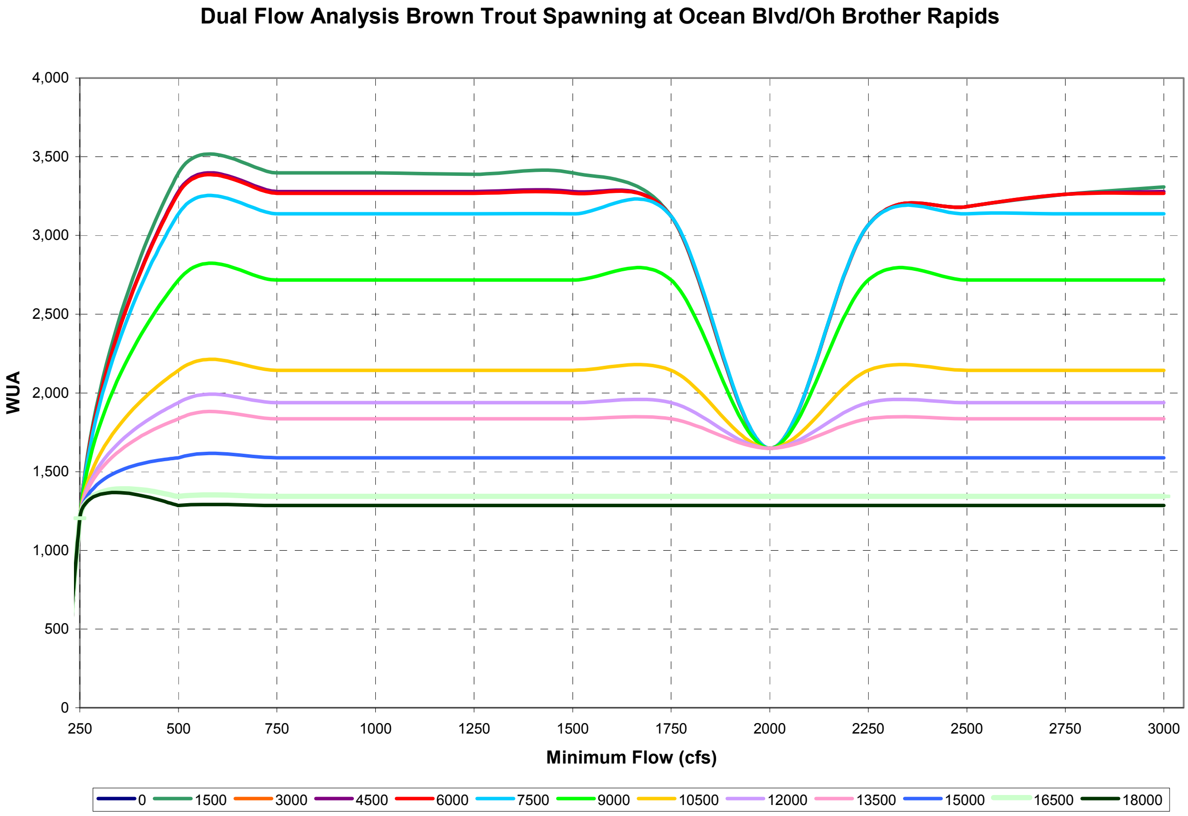
3.5. Dual Flow Analysis Brown Trout Juvenile at Shandon

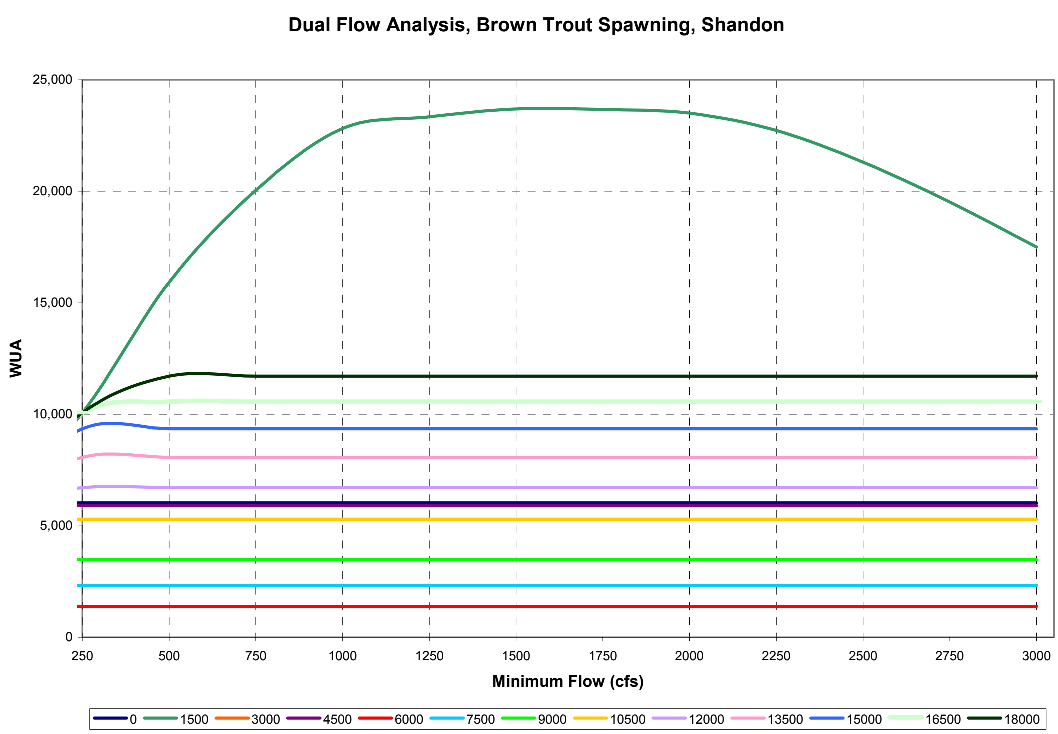
4. Brown Trout Spawning



4.1. Dual Flow Analysis Brown Trout Spawning at Toenail Riffle

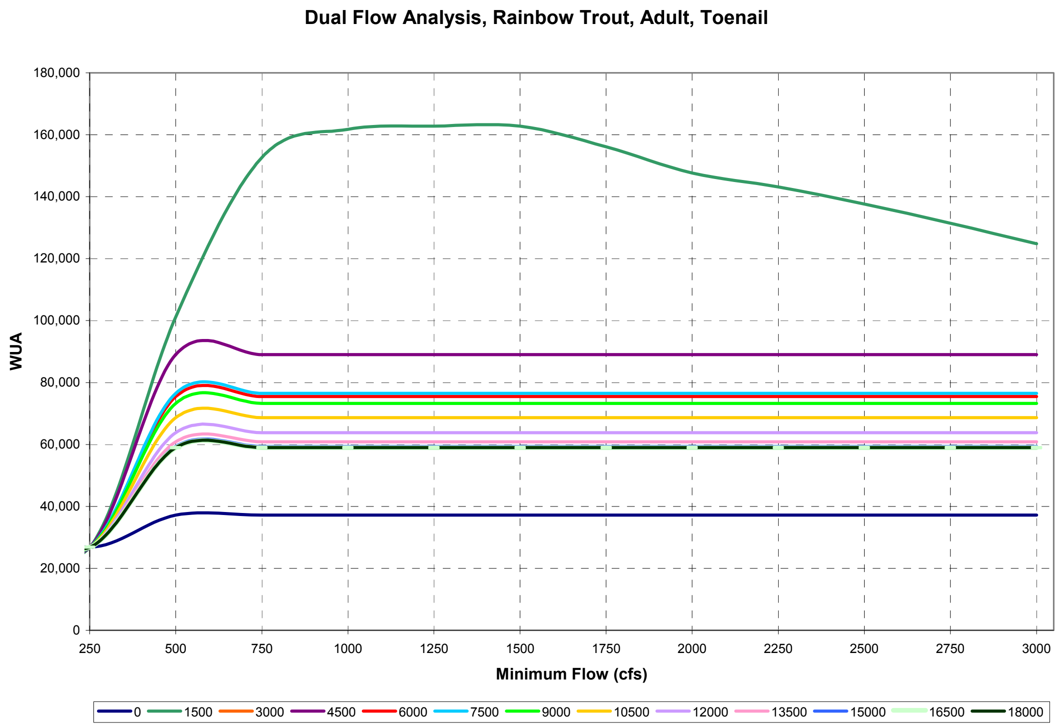
4.2. Dual Flow Analysis Brown Trout Spawning at Oceans Blvd/Oh Brother Rapids



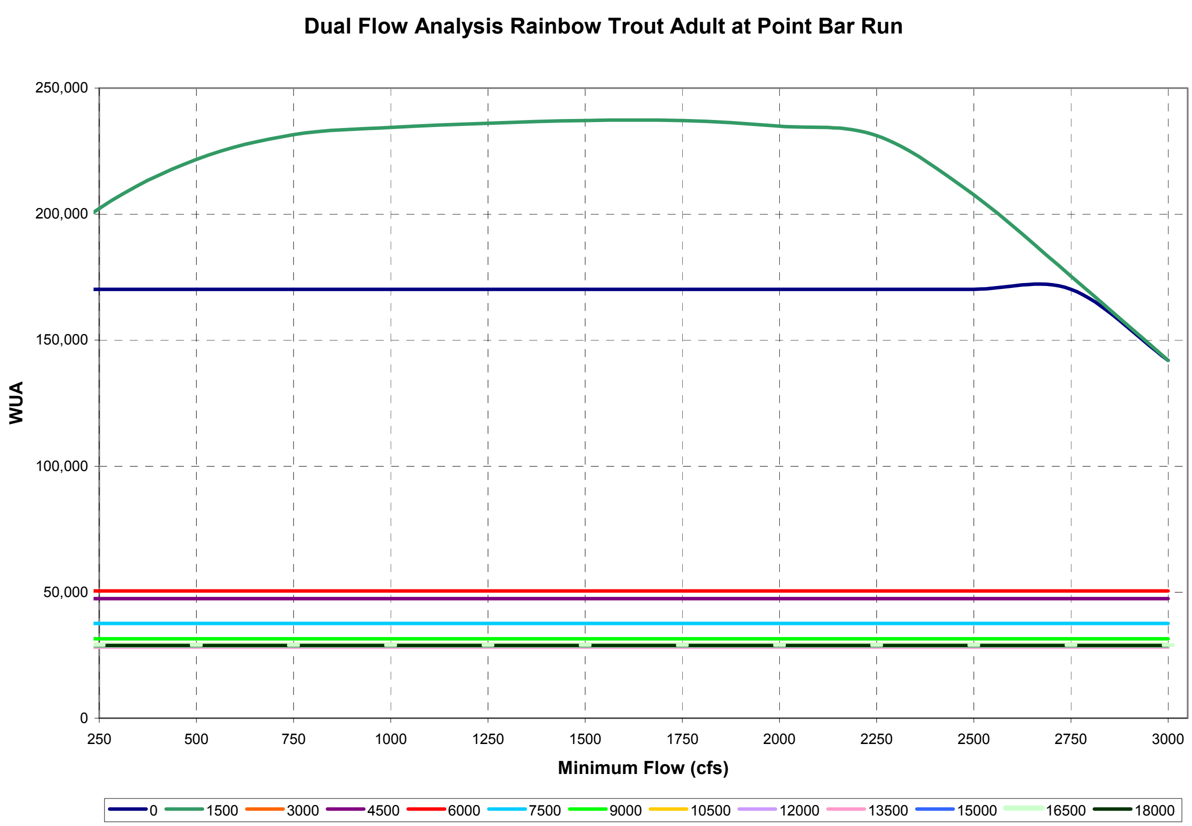


4.3. Dual Flow Analysis Brown Trout Spawning at Shandon

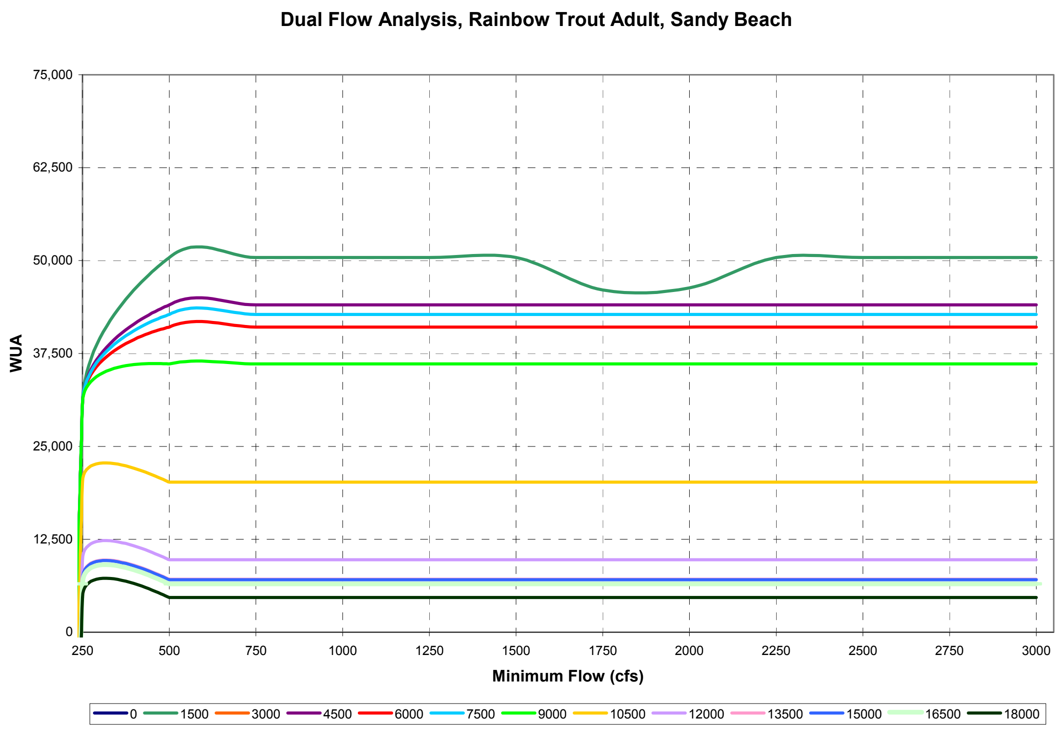
5. Rainbow Trout Adult



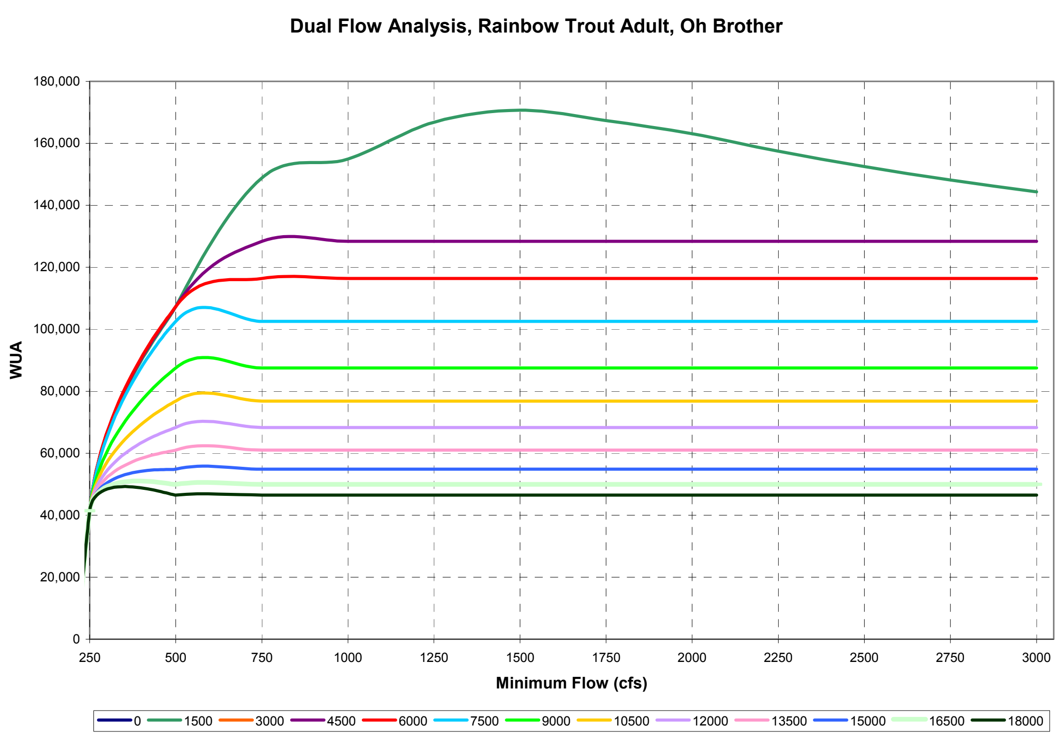
5.1. Dual Flow Analysis Rainbow Trout Adult at Toenail Riffle



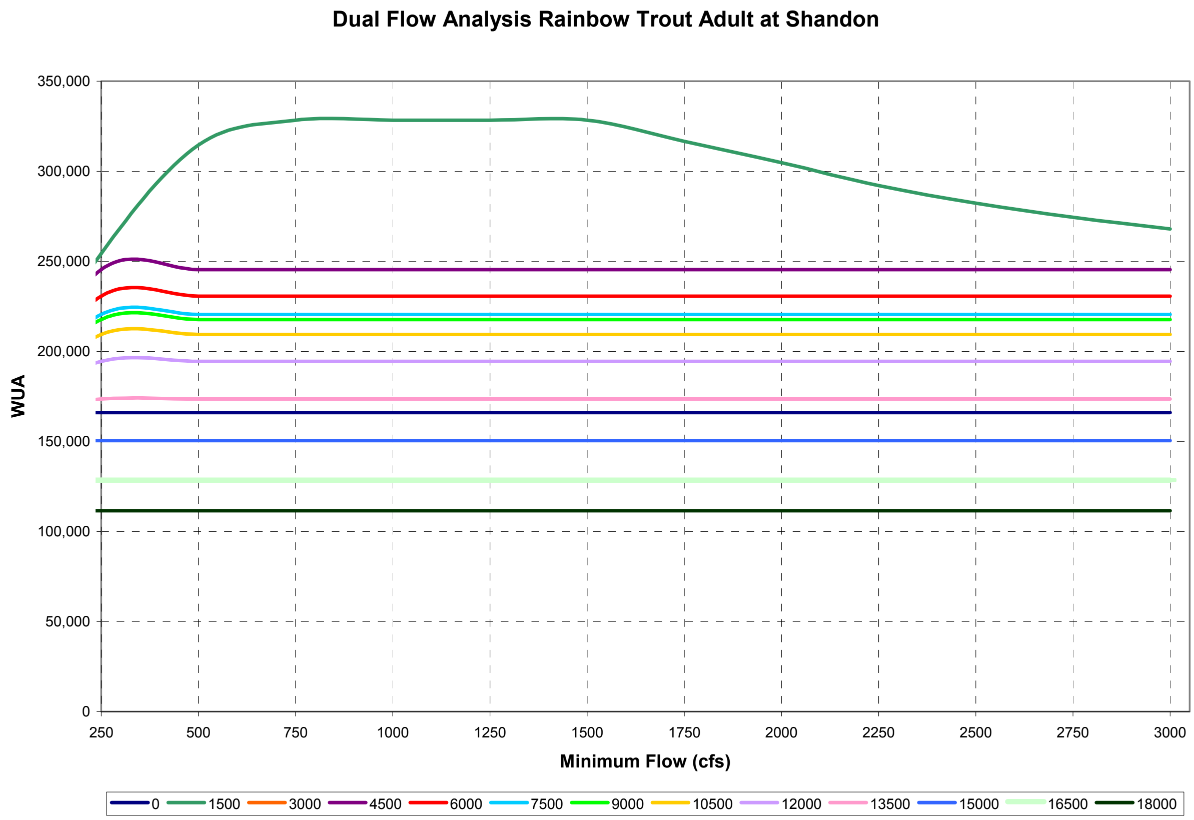
5.2. Dual Flow Analysis Rainbow Trout Adult at Point Bar Run



5.3. Dual Flow Analysis Rainbow Trout Adult at Sandy Beach

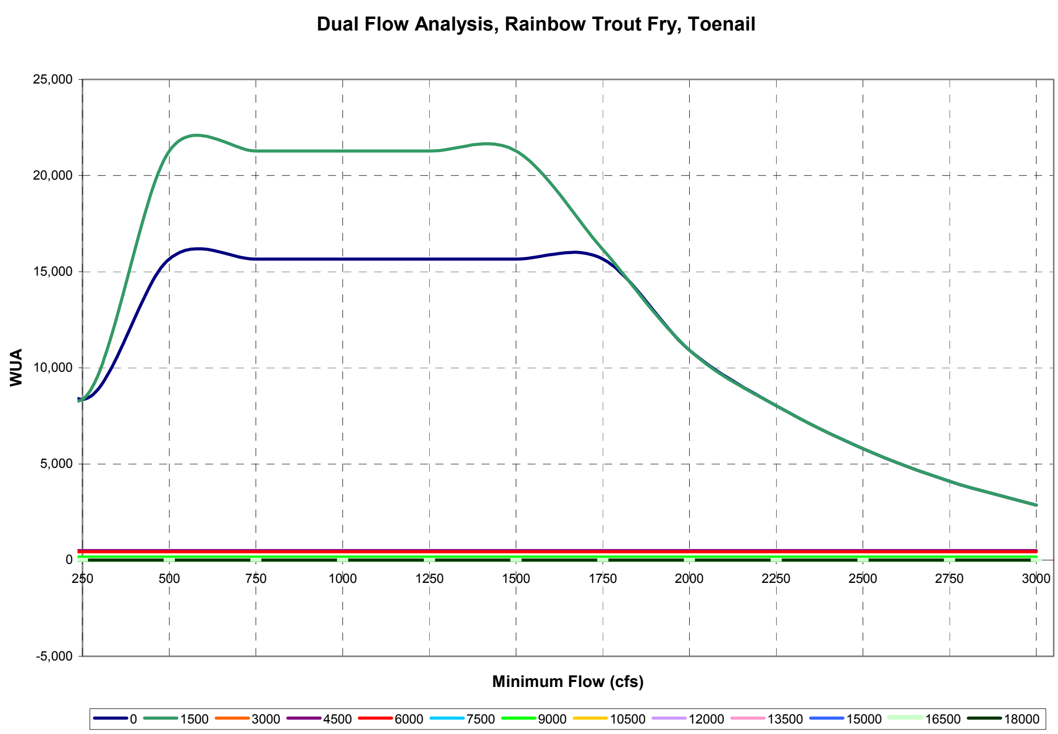


5.4. Dual Flow Analysis Rainbow Trout Adult at Ocean Blvd/Oh Brother Rapids

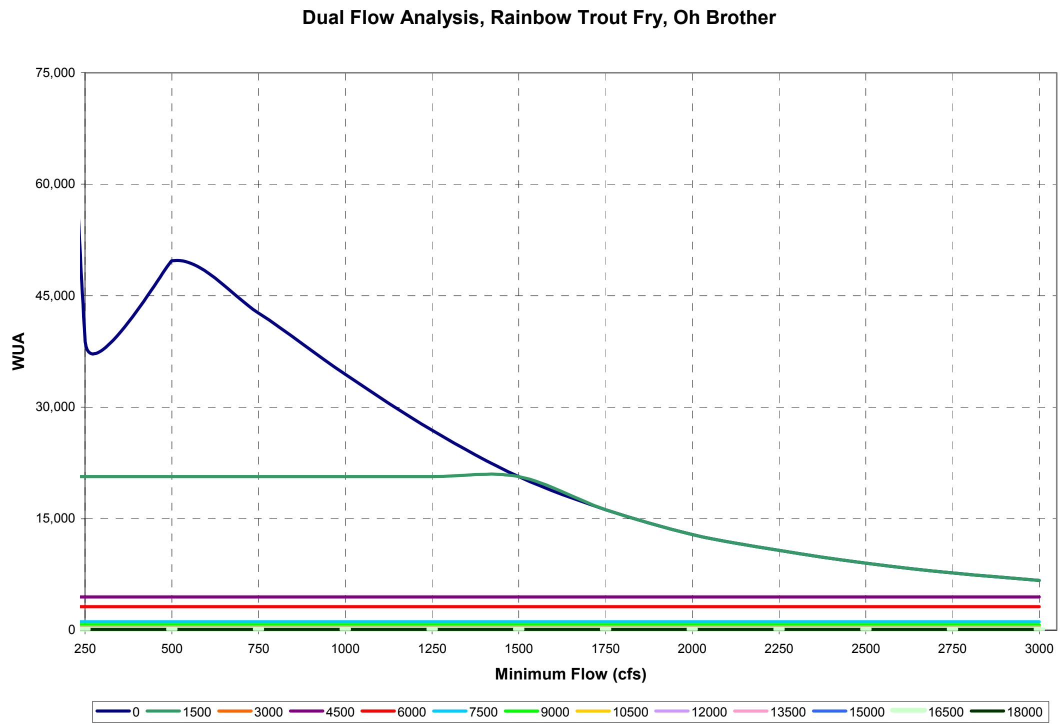


5.5. Dual Flow Analysis Rainbow Trout Adult at Shandon

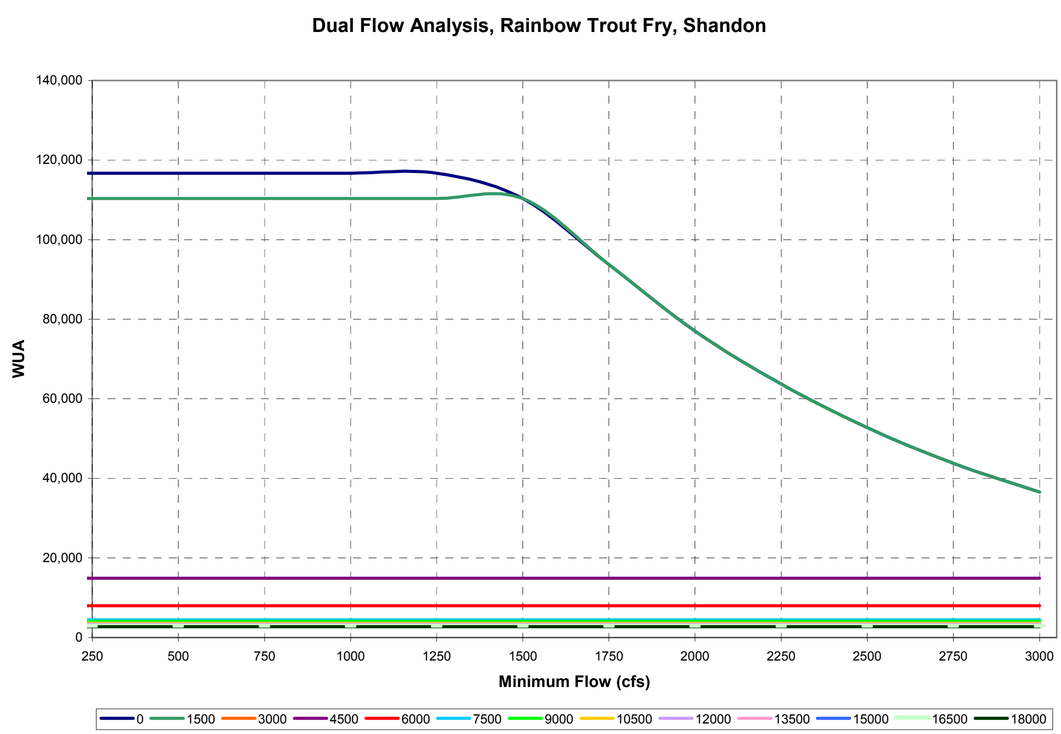
6. Rainbow Trout Fry



6.1. Dual Flow Analysis Rainbow Trout Fry at toenail Riffle

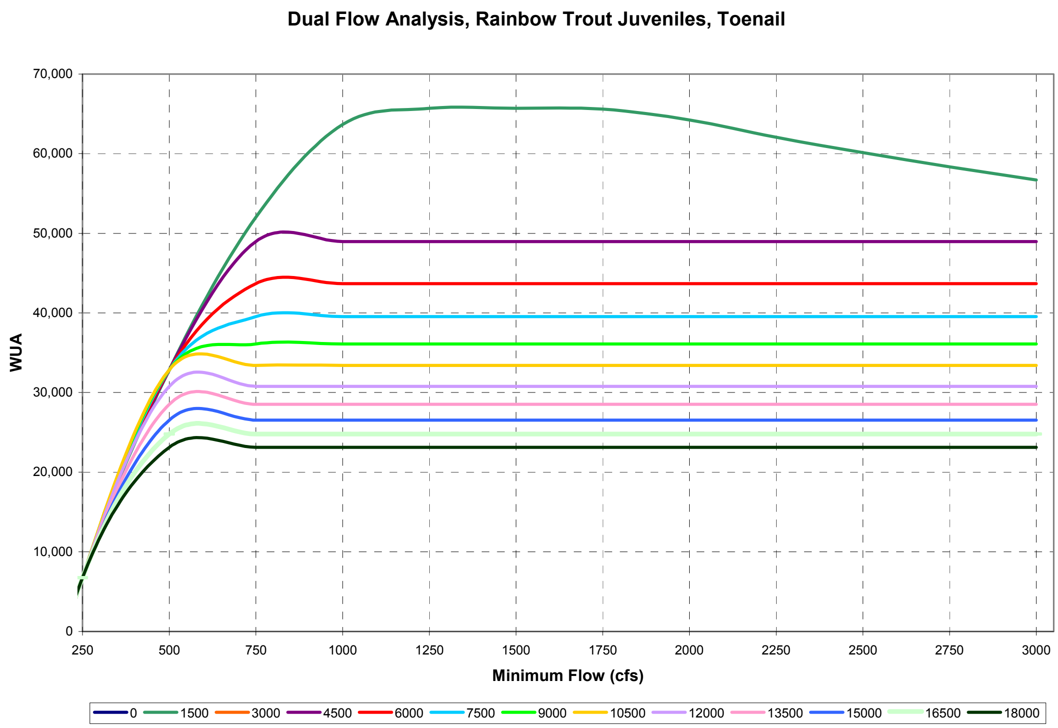


6.2. Dual Flow Analysis Rainbow Trout Fry at Ocean Blvd/Oh Brother Rapids

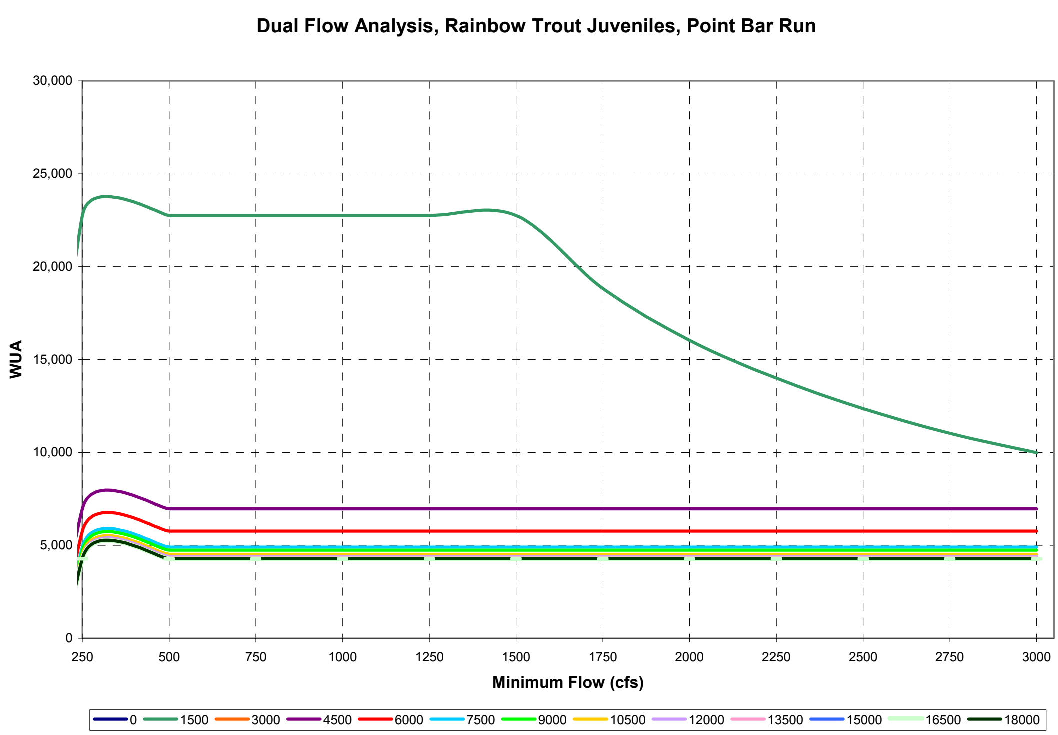


6.3. Dual Flow Analysis Rainbow Trout Fry at Shandon

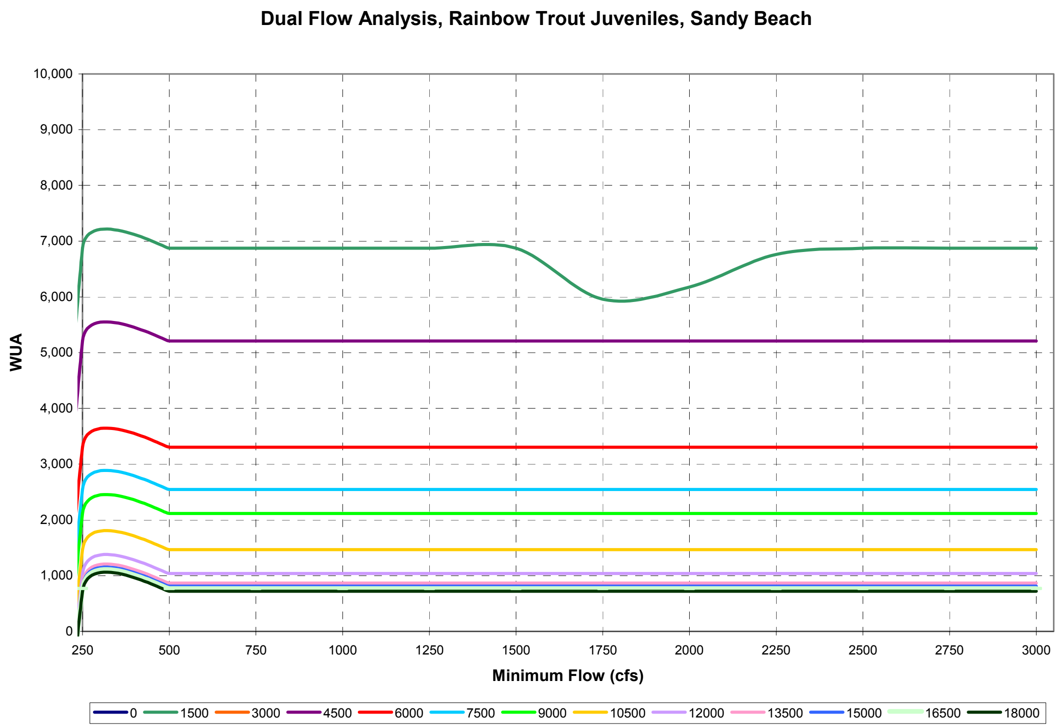
7. Rainbow Trout Juvenile



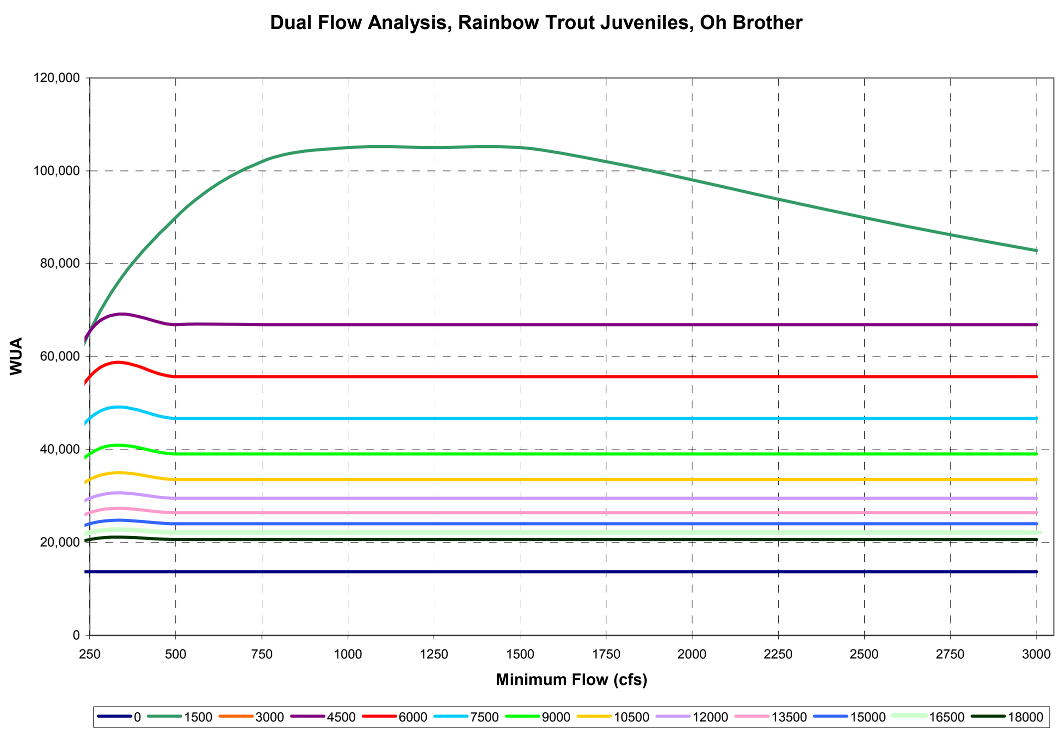
7.1. Dual Flow Analysis Rainbow Trout Juvenile at Toenail Riffle



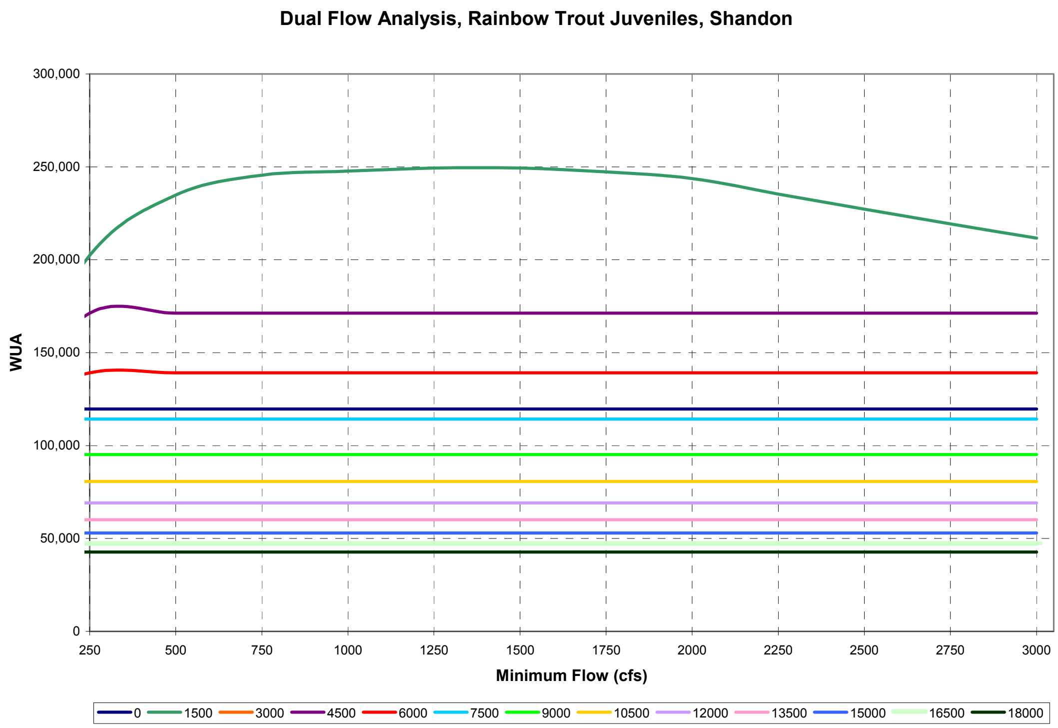
7.2. Dual Flow Analysis Rainbow Trout Juvenile at Point Bar Run



7.3. Dual Flow Analysis Rainbow Trout Juvenile at Sandy Beach

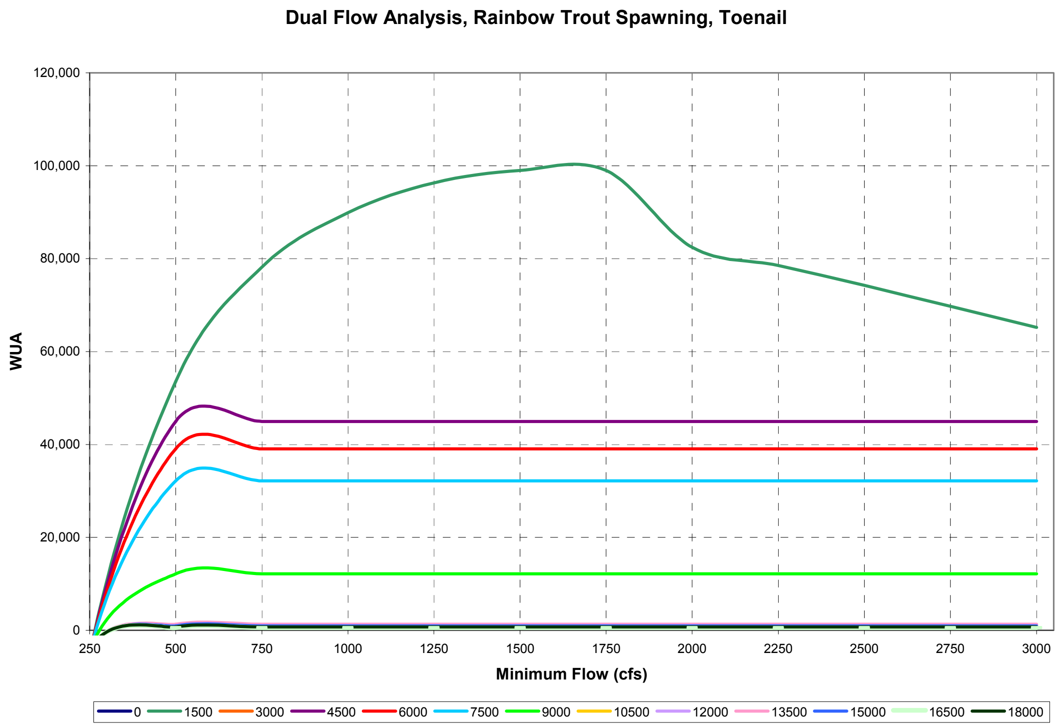


7.4. Dual Flow Analysis Rainbow Trout Juvenile at Ocean Blvd/Oh Brother Rapids

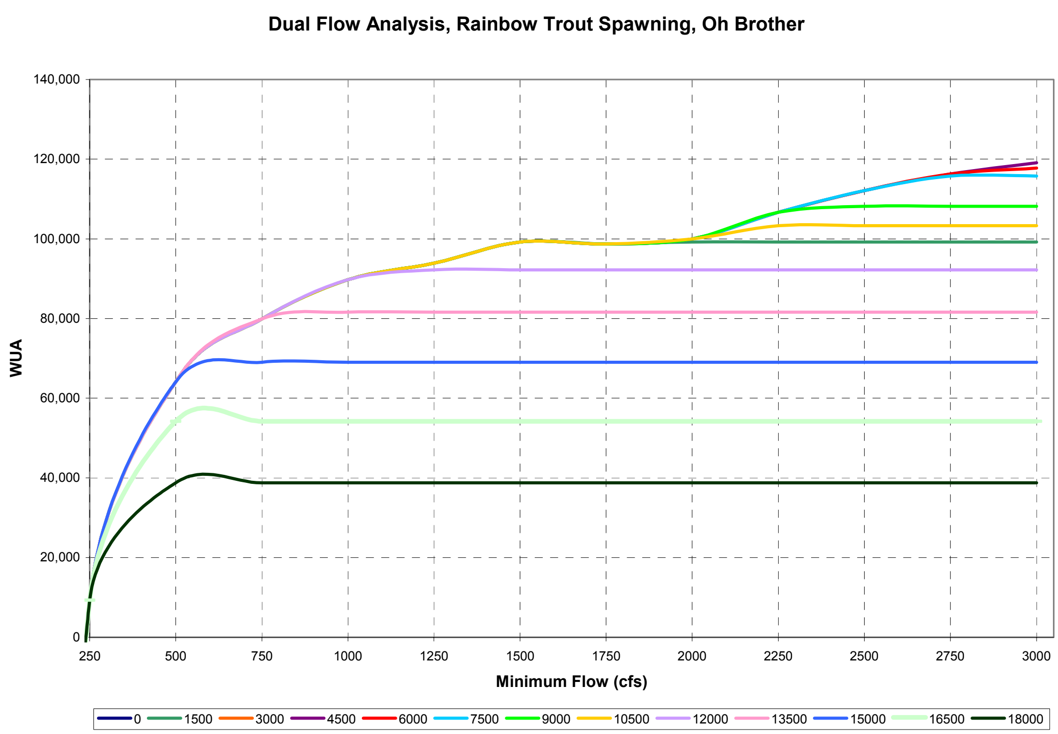


7.5. Dual Flow Analysis Rainbow Trout Juvenile at Shandon

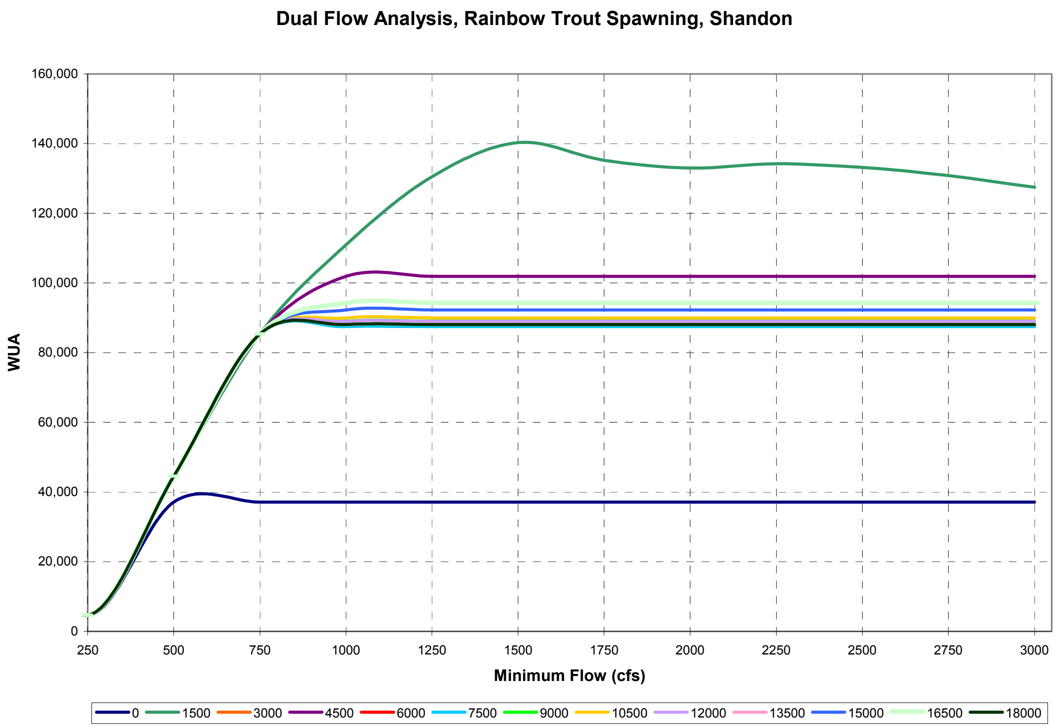
8. Rainbow Trout Spawning



8.1. Dual Flow Analysis Rainbow Trout Spawning at Toenail Riffle

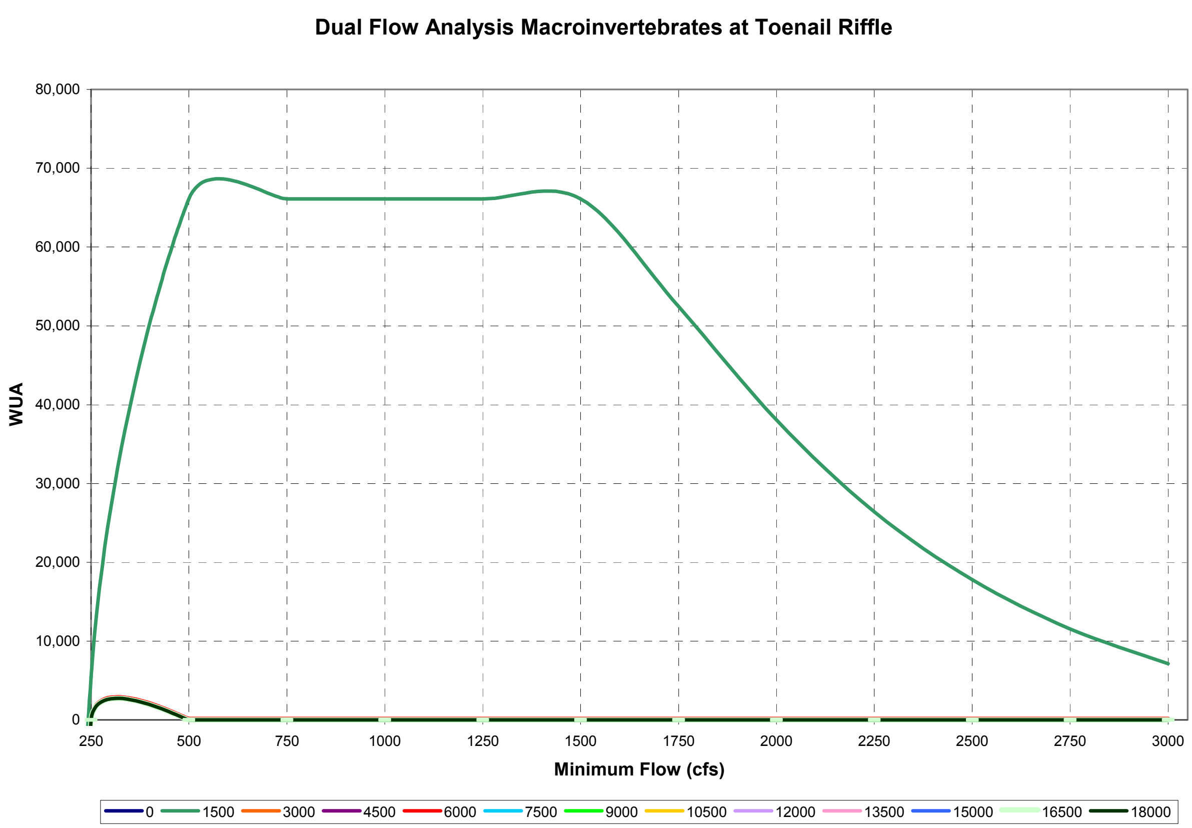


8.2. Dual Flow Analysis Rainbow Trout Spawning at Ocean Blvd/Oh Brother Rapids

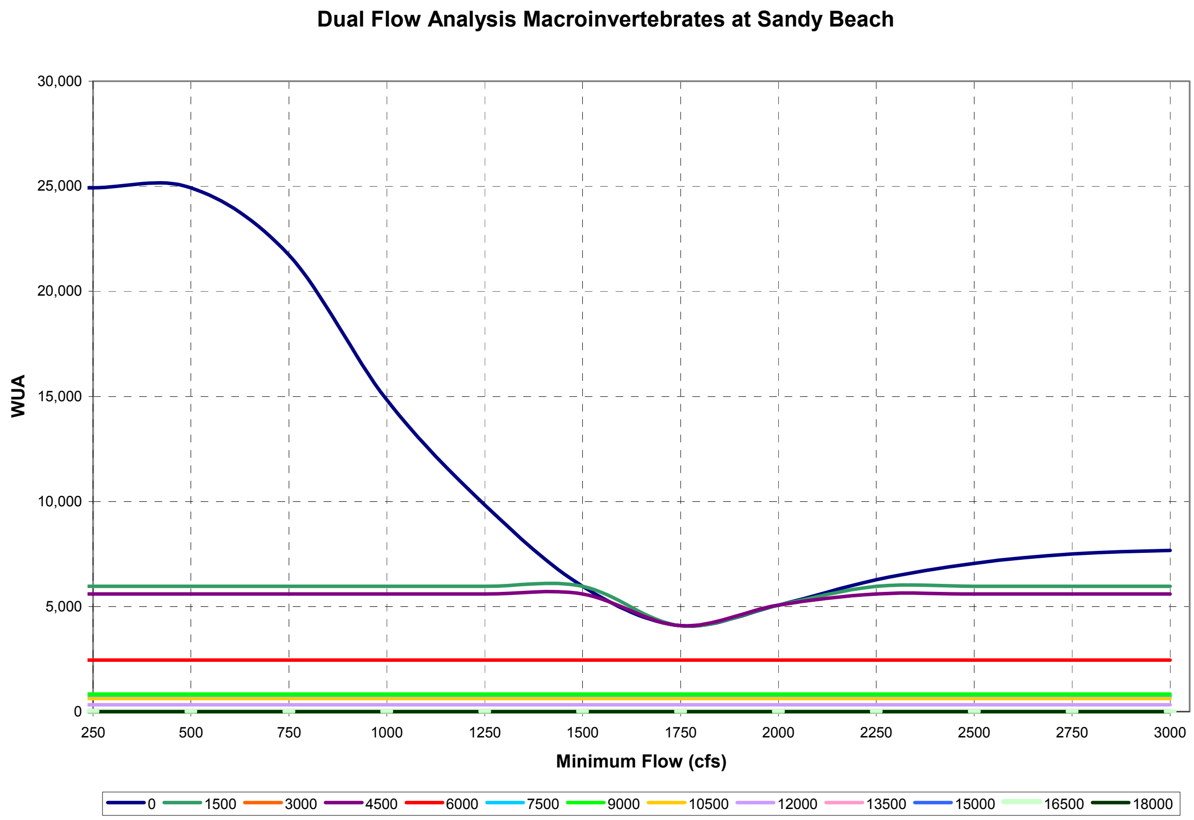


8.3. Dual Flow Analysis Rainbow Trout Spawning at Shandon

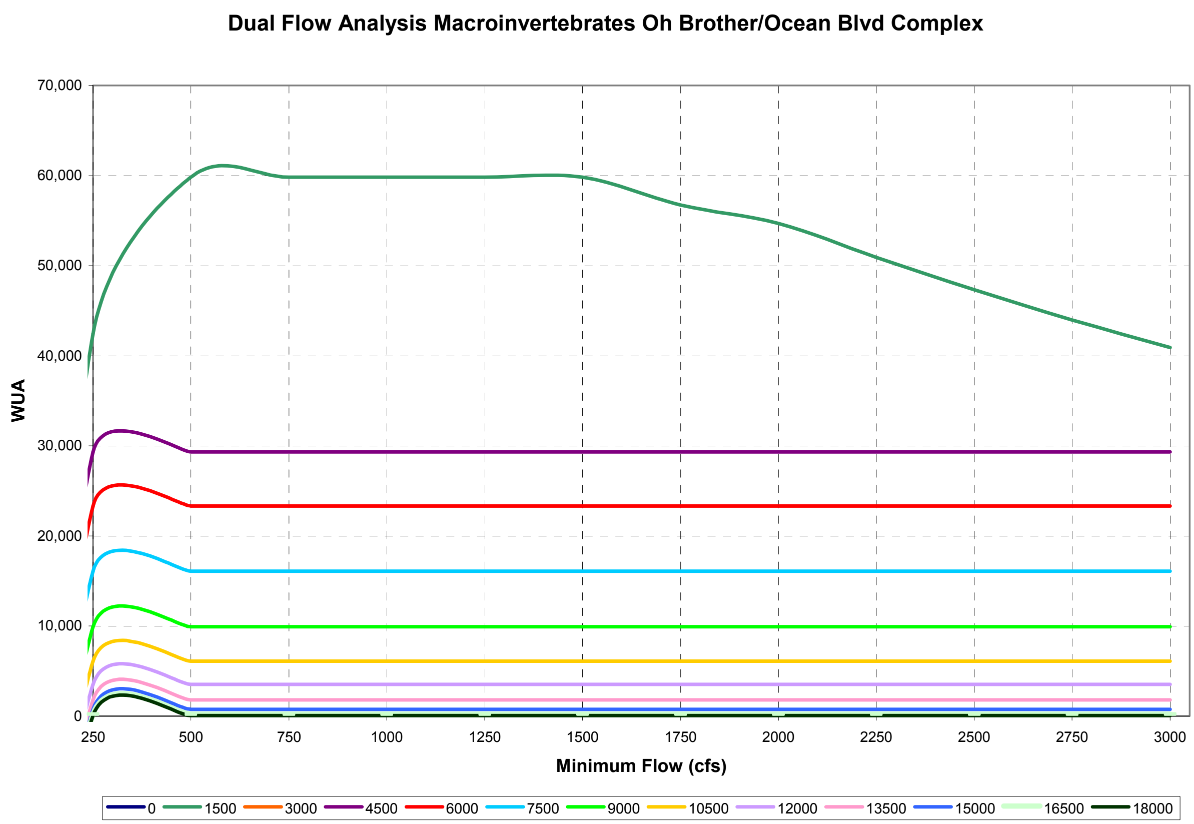
9. Macroinvertebrates



9.1. Macroinvertebrates at Toenail Riffle



9.2. Macroinvertebrates at Sandy Beach



9.3. Macroinvertebrates at Oh Brother/Ocean Blvd Complex