Reviewer's comments are in italic style.

General Comments

This paper presented a study on the effect of forest disturbance and climate variability on baseflow changes in a forested watershed. The main finding is that both forest disturbance and climate variability have significant effects on baseflow magnitudes and patterns. The manuscript is on a topic of interest to the journal and the methodology may have practical values. However, the description of the methodology is confusing at parts and the logic in the result section needs to be improved. My suggestion would be major revision.

Response: Thanks for the reviewer's efforts and comments on our manuscript. We agree that more detailed descriptions about the methods are needed. However, we must take a stance between too simple and too detailed descriptions as those methods have been applied and published by various studies. To address the reviewer's concern, we have added suitable details on the methods in the manuscript. Here are the revised descriptions of the methodology used in the manuscript.

Streamflow is divided into surface runoff (*RO*) and baseflow (*BF*). Theoretically, water balance in large watersheds can be expressed as:

$P = ET + RO + BF$ (3a) or $BF = P - ET - RO$ (3b).

In this study, effective precipitation (P_e) is then defined as the residual between precipitation after deduction of evapotranspiration and surface runoff. A linear relationship is assumed between accumulative baseflow (BF_a) and accumulative effective precipitation (P_{ae}) (Zheng et al., 2009; Wei and Zhang, 2010). Thus, the MDMC can be plotted by BF_a against P_{ae}. In this way, the effects of climate variability on annual baseflow can be eliminated. For a period with no or little forest disturbance, a straight line is expected, which is acted as the baseline indicating the linear relationship between BF_a and P_{ae}. Breaking points can be identified on the MDMC if there are significant influences from non-climatic variables, such as forest disturbance. The study period was subsequently divided into reference and disturbance periods by the breakpoint. Once the statistical significance are found, the relationship between BF_a and P_{ae} in the reference period was therefore employed to predict accumulative annual baseflow for the disturbance period. The difference between the observed and predicted values was treated as the annual baseflow deviation caused by forest disturbance (ΔBF_f). Thus, the annual baseflow deviation caused by climate variability can be determined as:

$$\Delta BF_c = \Delta BF - \Delta BF_f \tag{4}$$

Where, ΔBF, ΔBF_f and ΔBF_c are the deviations of annual baseflow, annual baseflow deviation caused by forest disturbance and climate change, respectively.

Specific comments:

1. *P6, L11: The elevations here are missing units.*

Response: We corrected the unit. The elevation ranges from 630 to 2400 meters above sea level.

2. *Figure 1: This figure only shows the part of watershed in Canada. Is the study also only considering the Canadian part of the watershed?*

Response: Thank the reviewer for pointing this out. Our watershed is an international watershed that spans from Canada to USA with the flow in the US portion eventually draining into our hydrometric station in Canada. Unfortunately, data on forest disturbance from the US portion are not available. To consider this, we have checked available historic documents and data, and noticed that there are no major disturbance events occurred in the US part. The US part of watershed is located in the national parks, where forest logging is prohibited. Thus, we believe that our forest disturbance data on the Canadian part is representative for the whole watershed. To address this concern, we have added some discussions on this uncertainty.

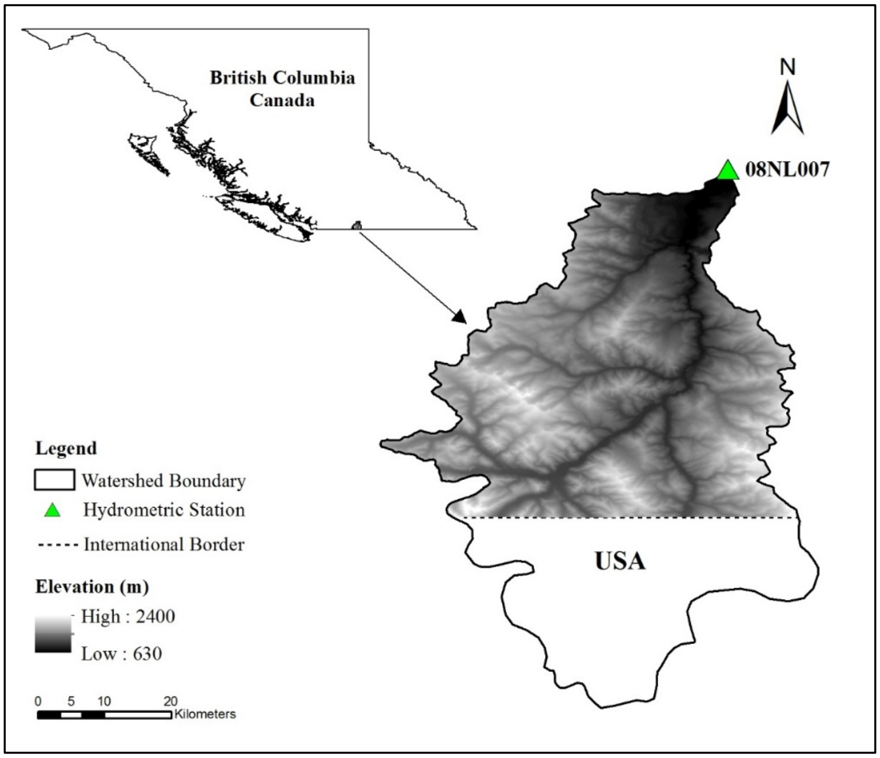

Figure 1. Location and elevations of the study watershed with the total area of 1810 km^2, of which 530 km^2 is in USA.

3. P11, L13-16: The definitions of C_{bf} and C_{ro} are described twice here.

Response: We have rephrased the sentences as follows.

C_{ro} corresponds to the highest flow, while C_{bf} corresponds to the lowest flow.

4. P15, L3-4: Please revise this part.

Response: We have revised this part in the method section. Please see our responses to the general comments for details.

5. P15, L9: Did you mean "linear"?

Response: Yes, this is a typo. We corrected it.

6. *P15, L14: I'm confused by the word "calibrated" here. Should it be "calculated"?*

Response: Yes, we changed the word "calibrated" to "calculated".

7. *In general, the methodology part of the manuscript needs to be revised to improve the clarity. The order of the sections and how they link to each other may need to be better explained.*

Response: Thanks for the suggestions. We have revised our descriptions on the methods (baseflow separation method and modified double mass curve). Please see our responses to the general comments for details.

8. *Figure 9: I assume the authors plot calculated groundwater discharge vs. calculated baseflow here to find breaking points that indicate baseflow changes. Even this method is described in previous studies, the authors may need to briefly explain the logic behind the method here. Also, what is "Pae"?*

Response: Thanks for pointing this out. We made a mistake in our calculations on determining the breakpoint of 1972 in the first version of our manuscript. We then re-calculated our data and determined that the new breaking point on MDMC was in the year of 1991, which coincides with forest disturbance history. The breaking point on MDMC were further confirmed by two breaking point tests (Table 3). Here are recalculated results.

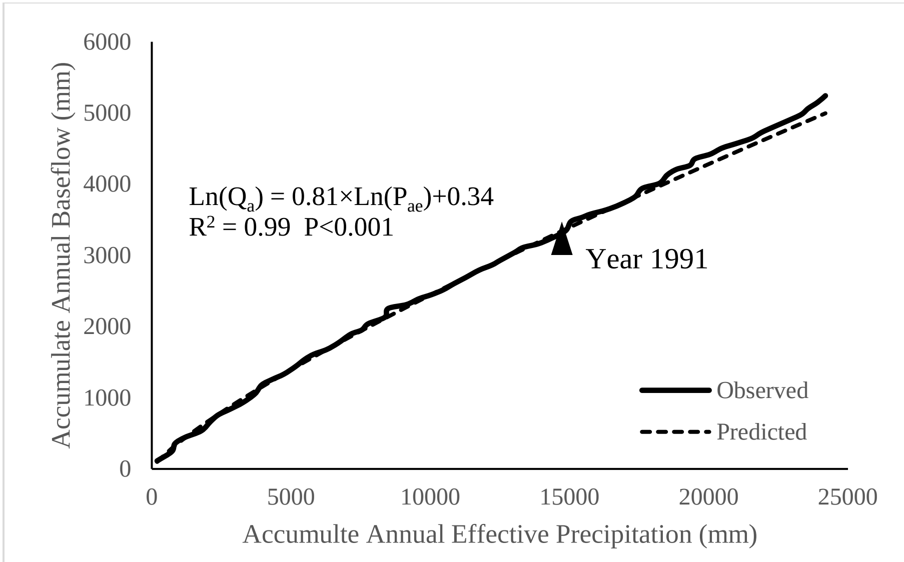

Figure 9. Modified Double Mass Curve of cumulative annual baseflow vs. cumulative effective precipitation.

Table 3. Breaking point tests for the slopes of MDMC for baseflow

Change Point	Pettitt test		Z test	
	K	P	Z	P
Year 1991	389	0.032	-3.39	0.001

Table 4. Relative contributions of forest disturbance and climate variability to annual baseflow in the Upper Similkameen River watershed from 1992 to 2013.

Period	ΔBF	ΔBF_f	ΔBF_f/BF (%)	ΔBF_c	ΔBF_c/BF (%)	R_f (%)	R_c (%)	CECA (%)
1992-2003	-5.6	4.6	5.9	-10.2	-13.0	36.5	63.5	14.6
2004-2013	2.7	11.7	14.2	-9.0	-10.9	61.4	38.6	24.6
1992-2013	-1.8	7.8	9.8	-9.7	-12.0	50.3	49.7	18.3

9. *P19, L1-4: Based on figure 4 and 5, there is no significant forest disturbance in 1972. Is there any other major changes in that period?*

Response: Please see comment 8 for details.

10. *The conclusion section need to be revised to provide a comprehensive summary of the study, in terms of methodology, discussion and general outcomes.*

Response: Here are the revision on conclusions.

We concluded that forest disturbance significantly increased annual baseflow of about 7.8 mm, while climate variability decreased 9.7 mm for the period of 1992 to 2013. The relative contributions of forest disturbance and climate variability were 40.3% and 59.7%, respectively for the study period. In addition, forest disturbance also altered seasonal baseflow patterns by increasing the spring baseflow and decreasing the summer baseflow. All those hydrological effects on baseflow have important implications for sustaining water supply and aquatic systems, which should be carefully managed.