Monitoring Subalpine Butterflies as Climate Changes
2017 Field Season

Introduction
Butterflies and plants are sensitive indicators of climate change because air temperature influences their life cycles and their geographic distribution. As butterflies develop from egg to larvae to pupae and finally to full maturation, temperature thresholds may trigger these changes. Plant budburst, flowering, and fruiting times are also influenced by temperature and precipitation. Butterflies depend on plants as host plants – providing nectar or shelter for eggs and developing larvae.

Climate models project warmer summers, earlier snowmelt, more frequent forest fires, and changes in distributions of plants and animals, but not details on how species in our area will respond to these conditions. Studies in Europe and California have documented range shifts in butterflies in response to changing temperatures. Some species have moved northward or to higher elevations to track their optimal temperature range.

We are monitoring butterflies and plant phenology to understand how species in our parks are being influenced by warmer climates.

What Are We Doing?
We are monitoring butterfly abundance and plant phenology at ten permanent survey sites in two national parks and two national forests:

- North Cascades National Park Service Complex
- Mount Rainier National Park
- Mount Baker-Snoqualmie National Forest
- Okanogan-Wenatchee National Forest

Monitoring Objectives
1. Monitor long-term trends in butterfly species richness and population abundance in select areas
2. Monitor long-term trends in plant phenology
3. Engage citizen scientists in collection of data and communication of information to the general public
4. Provide field science internship opportunities to young scientists
5. Provide data to national parks and forests to inform and adapt land management practices as climate changes

Monitoring Methods
- Butterfly abundance and plant phenology is monitored along ten 1-kilometer survey routes in 2 national parks and 2 national forests
- Monitoring is conducted weekly from snow-melt (~early July) until the first frost (~early September)
- Butterfly abundances are monitored using the Pollard Walk method
- Butterfly data are stored in partnership with the North American Butterfly Monitoring Network’s Pollard Base database (NABA) and Butterflies and Moths of North America (mp.butterfliesandmoths.org)
Results - Butterflies

Each year we have completed more surveys and documented more species with our volunteers and interns.

Table 1. Summary of number of surveys, species documented, and butterflies from 2011 – 2016.

<table>
<thead>
<tr>
<th>Year</th>
<th># Surveys</th>
<th># Species</th>
<th># Butterflies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>29</td>
<td>23</td>
<td>819</td>
</tr>
<tr>
<td>2012</td>
<td>29</td>
<td>21</td>
<td>480</td>
</tr>
<tr>
<td>2013</td>
<td>34</td>
<td>21</td>
<td>1,585</td>
</tr>
<tr>
<td>2014</td>
<td>65</td>
<td>30</td>
<td>2,519</td>
</tr>
<tr>
<td>2015</td>
<td>100</td>
<td>36</td>
<td>4,431</td>
</tr>
<tr>
<td>2016</td>
<td>82</td>
<td>37</td>
<td>3,573</td>
</tr>
</tbody>
</table>

In 2016, our first date of butterfly observations and peak abundances were lower than we had seen in the early snowmelt, warm summer of 2015.

Results - Volunteer Involvement

Our program started in 2011 and our volunteer corps is growing allowing us to survey sites more frequently.

More Information

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