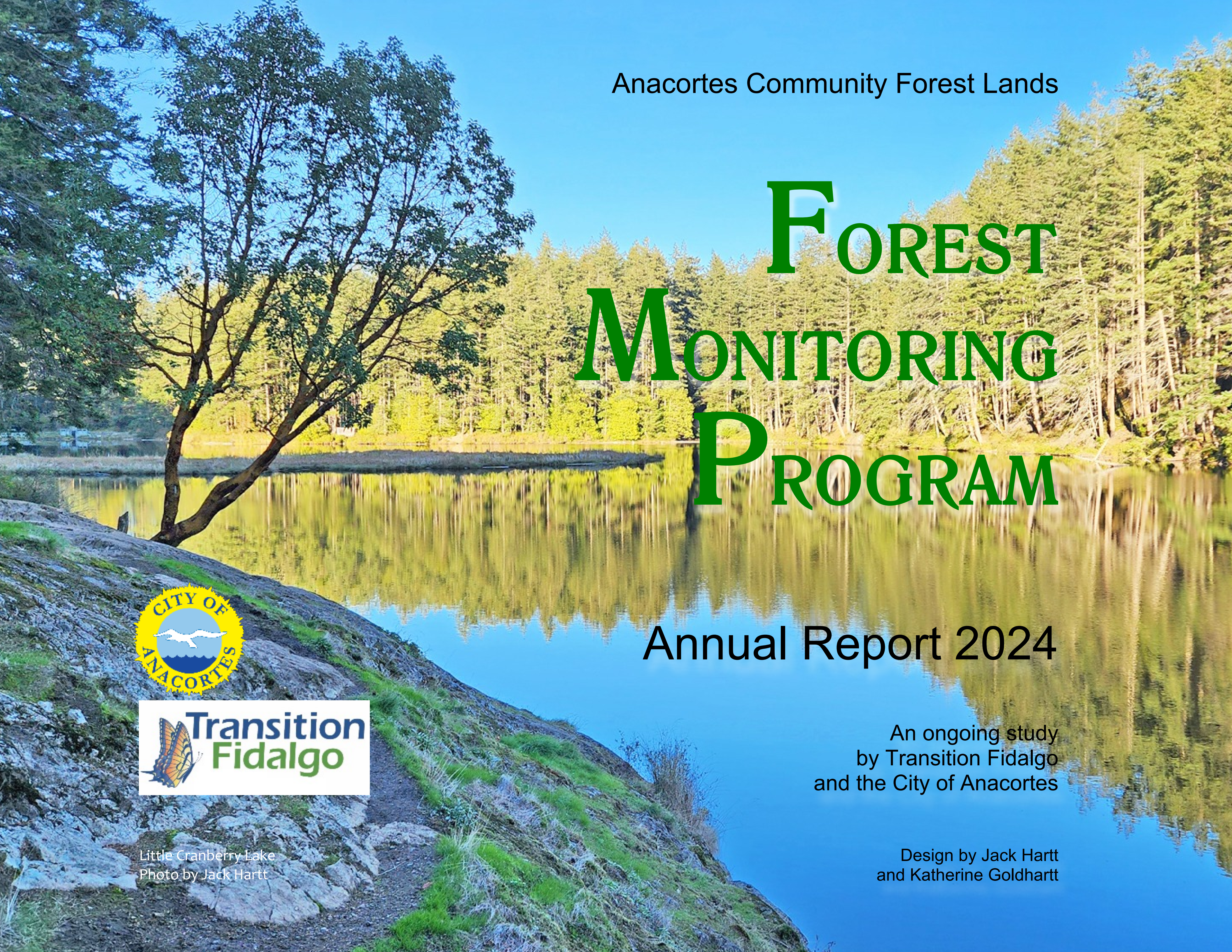
Anacortes Community Forest Lands

Forest Monitoring Program

Annual Report 2024

An ongoing study
by Transition Fidalgo
and the City of Anacortes

Design by Jack Hartt
and Katherine Goldhartt



Little Cranberry Lake
Photo by Jack Hartt

Introduction

By Eric Shen

The Anacortes Community Forest Lands (ACFL) is a local treasure that covers almost 3000 acres of Fidalgo Island. From its spectacular views from the top of Mount Erie to the serenity of the ancient Douglas-firs living near Heart Lake, the ACFL is a unique community forest. Our ACFL is the envy of communities throughout the country.

For more than 100 years, the City of Anacortes and the residents of Fidalgo Island have diligently worked to build what is now the Anacortes Community Forest Lands. Protecting this forest network has been and continues to be a major focus of our community.

In 2019, Transition Fidalgo together with the City of Anacortes launched a forest monitoring program to record baselines of the health of the plant species living in the forest and to understand how the impacts from a changing climate are impacting and will impact the forest ecosystems in the future.

The end of 2023 marked the completion of five years of surveys conducted in the ACFL by over 70 of our citizen scientists and professionals. In the early days, the data collected was loosely organized and stored in our online database.

Starting near the end of 2023, a major effort on the part of our data manager, Megan Broadie, made significant progress in organizing our database, ensuring that the data files are complete and accurate, and perhaps most significantly, developing methods to summarize and display the data in a manner that is easily understood. You will see some of the results of her efforts and our project leads in this year's annual report. Our goal is to create an online presence where our processed data can be viewed and shared with the public.

This year's report will discuss the findings and observations from our Forest Stewards who staffed the seven projects that comprise the ACFL Monitoring Program. Many of our projects have been able to integrate the weather and soil moisture data into their findings to start tracking correlations. In most cases, the data-set durations are too short to be able to make definitive conclusions, but they will become clearer as monitoring progresses into the future.

Transition Fidalgo thanks our Forest Stewards for their contributions throughout the past five years to make the ACFL Monitoring Program a success. This report reflects their work to create the data that has led to the observations and conclusions that follow.

Photo by Jack Hartt

Forest Plot Studies

Project Lead: Dave Peterson

Overview

This project quantifies the long-term forest dynamics, health, and vigor of selected locations in the ACFL.

Some forest areas of the ACFL have experienced significant stress, dieback, and tree mortality, a phenomenon observed in much of western Washington since 2015, presumably associated with recent dry summers. Stress symptoms in the ACFL may indicate the early stages of an altered forest structure associated with extreme drought and perhaps a long-term response to climatic variability and change.

Data on forest composition and structure are collected at two locations:

Six plots adjacent to Trail 201 (WL201, near Whistle Lake), where recent tree mortality and dieback have been observed. Dominant tree species are Douglas-fir, western redcedar, and western hemlock.

Six plots adjacent to Trail 304 (WL304, east of Heart Lake), where forest health appears to be good and recent mortality and dieback are not apparent. Dominant tree species are western redcedar, bigleaf maple, Douglas-fir, grand fir, and western hemlock.

Progress report

In 2023, we recorded (1) if each tree was alive or dead, and (2) crown density (as a measure of tree vigor).

Data collected in 2023 — Whistle Lake trail 201

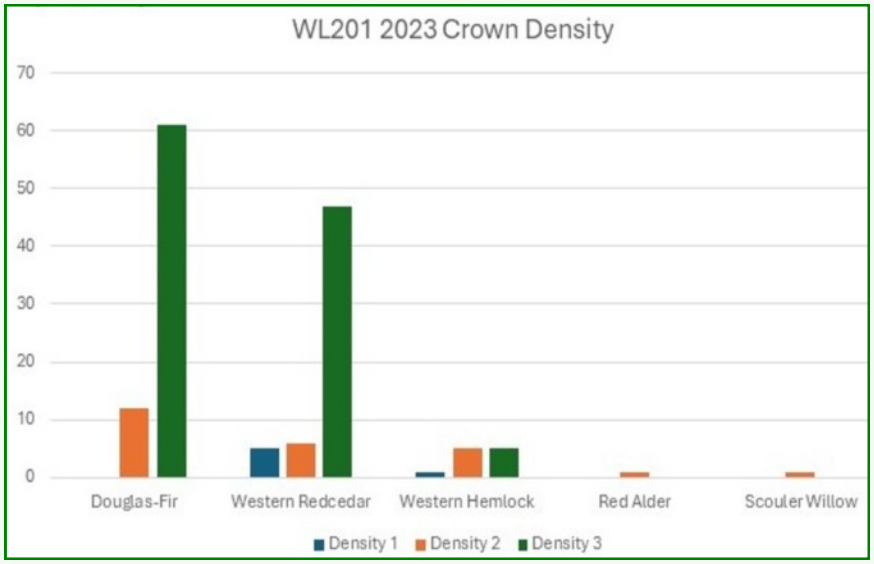
	Trees per hectare*	Percent live	Crown density (percent of live trees)		
			Low	Medium	High
Douglas-fir	358	86	0	17.6	82.4
Western redcedar	346	70	8.7	10.5	80.7
Western hemlock	75	56	10.0	40.0	50.0

Note: A few red alders and Scouler willows are present but not included in the table.

* 1 acre = 0.4 hectare

WL201 has 779 trees per hectare (307 trees per acre), with Douglas-fir comprising most of the bigger overstory trees. All seedlings and saplings in the understory are western redcedar and western hemlock. Dead trees are a large structural component of the forest—21% of the total. Of greatest concern is that 44% of western hemlocks and 30% of western redcedars are dead. Although total mortality of all species (25.4%) seems high, the average diameter of the dead trees is much smaller than for live trees, so the overall canopy has not been greatly affected. Crown density is relatively high for Douglas-fir and cedar, which suggests that overall health is not declining.

Recent mortality of western hemlock and western redcedar was likely caused by periods of low soil moisture during spring and summer. The magnitude of mortality is like a "normal" self-thinning, as would be expected for a maturing stand. Little mortality has occurred in Douglas-fir, which is tolerant of low soil moisture and has deep roots. Shade-tolerant cedars in the understory have the potential to grow into the canopy over time. If a warming climate causes more periods of low soil moisture during the growing season, WL201 may experience further tree mortality and increased dominance by Douglas-fir.



Forest Plot Studies

(Continued)

WL304 has 807 trees per hectare (318 trees per acre), of which 37% are western redcedar, 32% are bigleaf maple, and 13% are Douglas-fir. Most cedars are small in terms of diameter and height. Bigleaf maples are larger, with a significant presence in the canopy. Douglas-firs are generally large, mature trees with high crowns. The only saplings in the understory are cedars. Dead trees are a small structural component of the forest, only 9% of the total. Many of the dead trees are small in diameter and height and often near other trees where competition was high. There are no dead western redcedars.

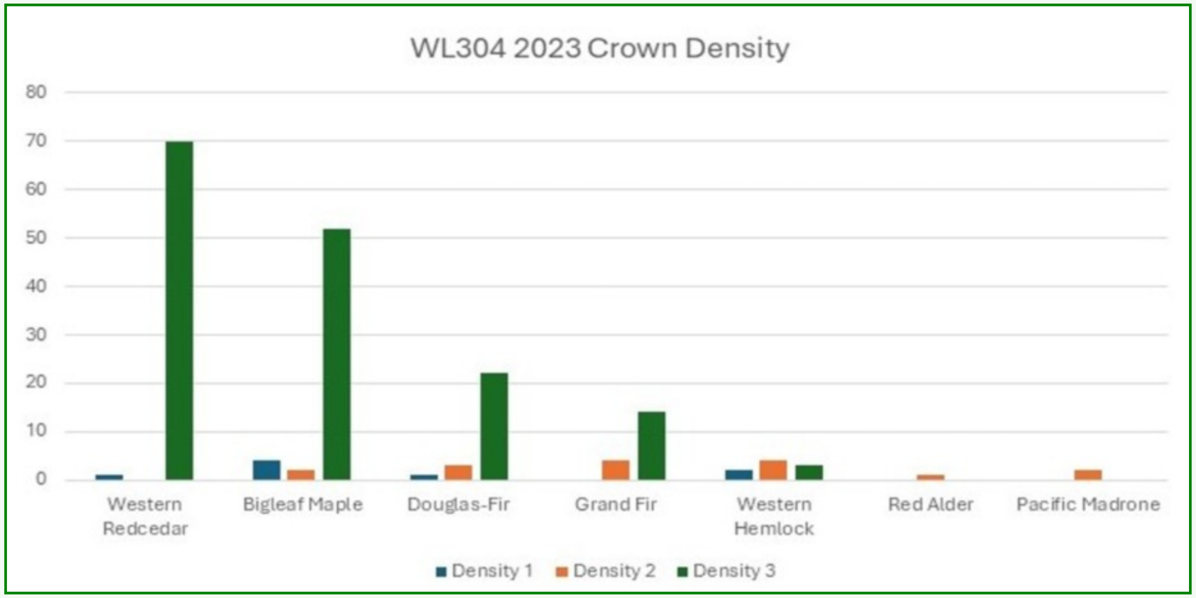
Stand density in WL304 is higher than would be desirable for a healthy, mature forest in the long term. Natural self-thinning appears to be occurring gradually, mostly for western hemlock and to some extent for bigleaf maple. Shade-tolerant cedars have regenerated in high numbers in the understory and have the potential to grow into the canopy over time. Dry summers since 2015 have had minimal effects on the WL304 forest, which has deep soil profile that retains moisture throughout the summer.

Data collected in 2023 — Whistle Lake trail 304

	Trees per hectare	Percent live	Crown density (percent of live trees) Low	Medium	High
Western redcedar	295	100	1.4	0	98.6
Bigleaf maple	262	92	5.3	3.5	91.2
Douglas-fir	104	92	0	13.0	87.0
Grand fir	79	95	0	22.2	77.8
Western hemlock	67	50	25.0	50.0	25.0

Note: A few red alders and European mountain ashes are present but not included in the table.

* 1 acre = 0.4 hectare



A big thank you to our plot study volunteers:

Kari Bishay, Bill Buchman, Michael Hannah, Sam Hardesty, Jan Hersey, Tim Hyatt, Hannah Katz, Dan Miner, Taft Perry, Sarah Roberts, Sarah Pedersen, Patt Weber, Jan Weedman, and Dave Peterson

Dan Miner, Taft Perry, and Sam Hardesty heading out onto the trail.

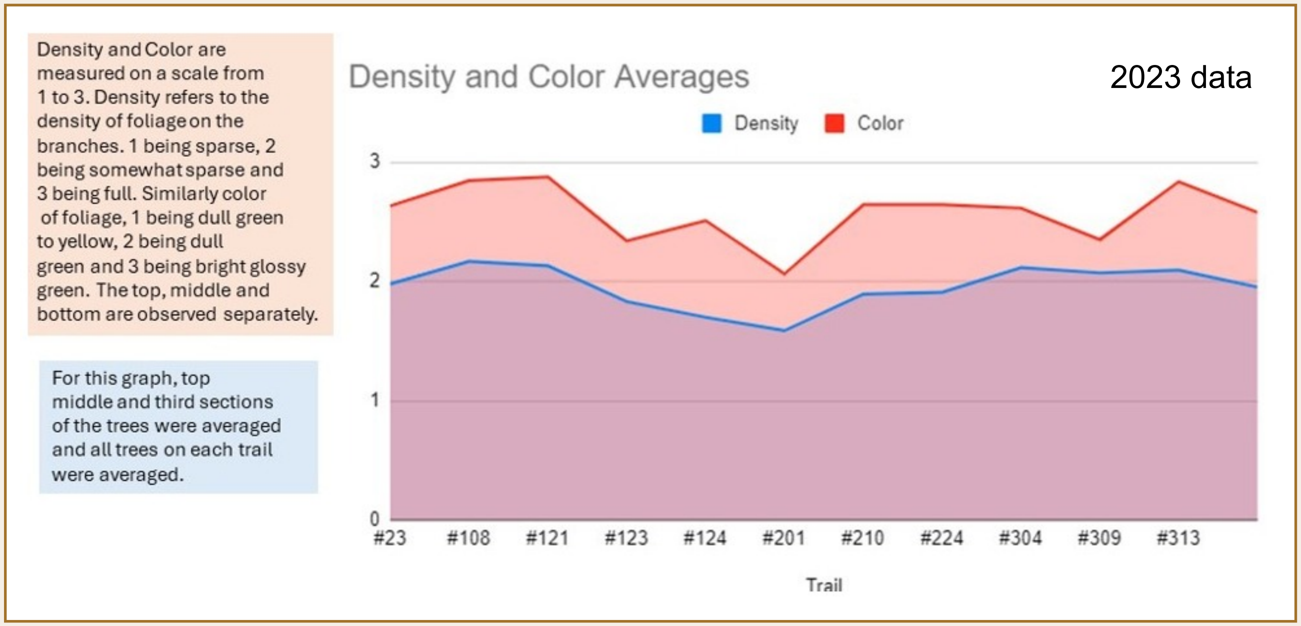
Western Redcedar Mortality Project

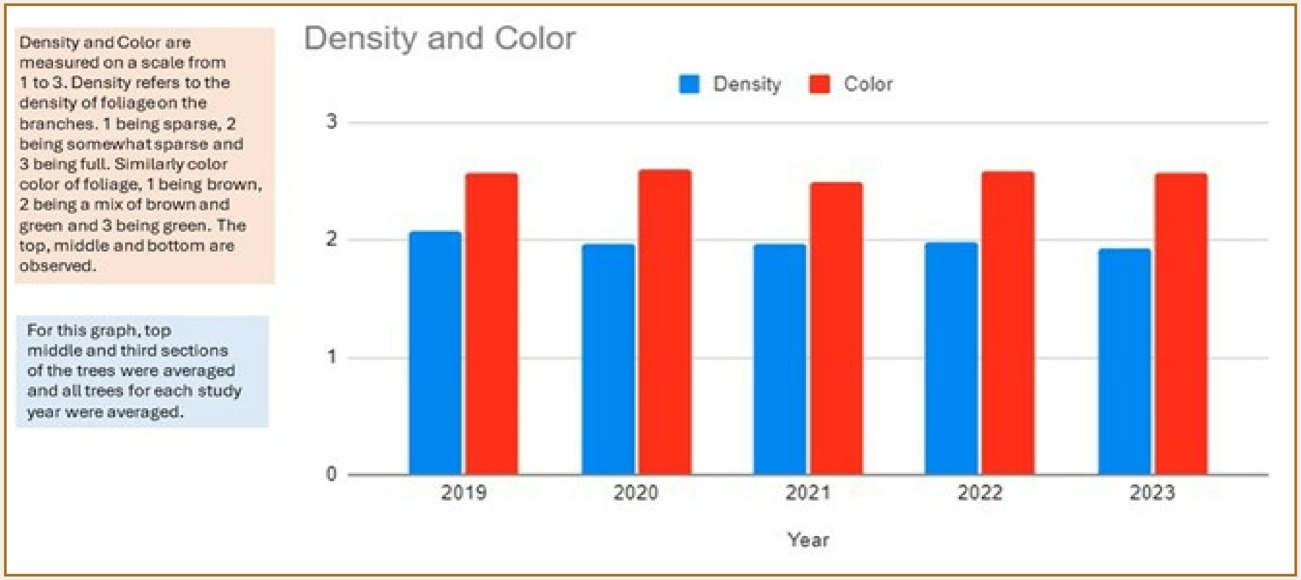
By Eric Shen & Jon Ranney

The years following the 2015/2016 drought and high temperature periods saw unusual numbers of western redcedar fatalities in the ACFL and in the PNW region. The City of Anacortes and the local community became concerned that a long term die-off was occurring in our forests. This concern gave birth to the ACFL Monitoring Program in 2019, in which the Western Redcedar Mortality Project was created to examine the health of the cedars.

Each year our citizen scientists have gone out to survey the health of the cedar trees on specific trails throughout the forest. To characterize tree health, the project looks at the color of the foliage and the density of that foliage as indicators of health. The survey teams characterize the health of a minimum of 100 trees on each of the eleven trails on an annual basis.

The graph above combines the health characteristics of all trees surveyed on each trail to create an average for the trail. The observations show that tree foliage densities from trail to trail are similar, with the trees located on drier trails (such as trail 201) being on the lower end of the range. The color of foliage also shows a drop in the ratings of trees located in drier areas.





When the tree health characteristics of all trails are averaged together each year and then plotted side by side, it is clear the western redcedars in the ACFL are not declining or suffering a dieback at this time.

Since only eleven trails are monitored, it is possible there are other areas of forest that are in decline, but the trails selected for monitoring are considered representative of the various ecosystems found in the ACFL.

Our Cedar Monitoring Volunteers:

Taft Perry, Dan Miner, Ruth Bachrach, Elizabeth Drozda, Sarah Roberts, Diana Gay, Sarah Pederson, Shirley Hoh, Jack Hartt, Katherine Goldhartt, Laurie Sherman, Becky Vavrosky, Dave Crockett, Tamela Taylor, Robbie Hutton, Evelyn Adams, Lynn Wohlers, Rosann Wuebbels, Eric Shen, and Jon Ranney.

Thank you for your time and dedication to making the 2023 western redcedar monitoring surveys the most complete and accurate since the beginning of this project.

Analysis of Cedar Mortality

By Jon Ranney

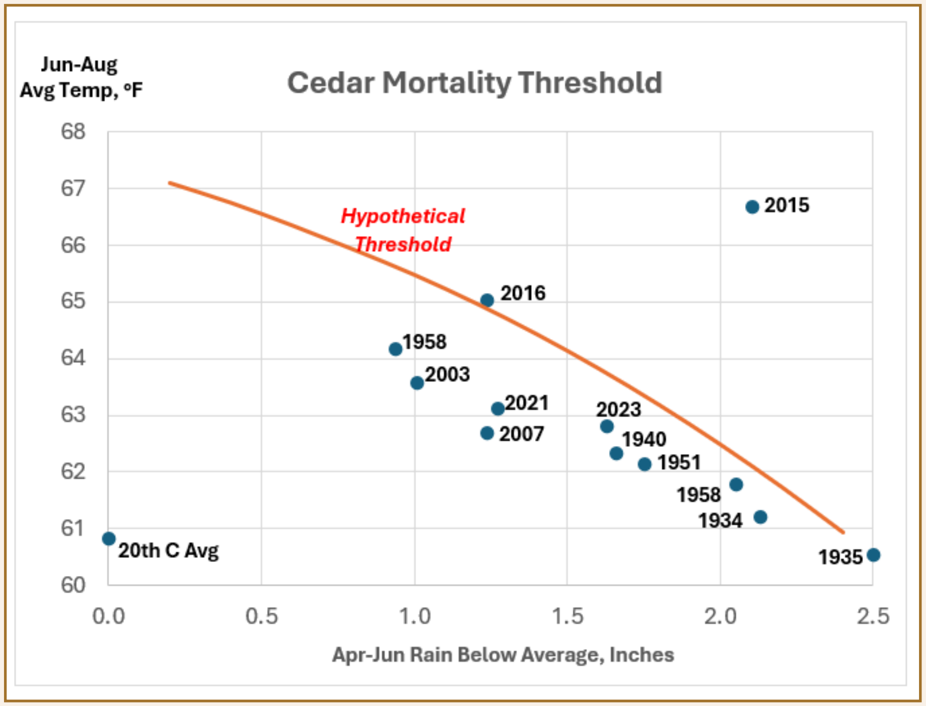
A dry spring can be stressful for Western Redcedars, especially in combination with a warm summer. The April through June period of 2023 was the fifteenth driest in the past 124 years , while the two month May-June period was the ninth driest. As an unusually dry spring, 2023 serves as a useful benchmark in our ongoing efforts to understand the effects of weather extremes.

By correlating our weather data with observations in the field from the cedar and soil moisture surveys, we hope to gain a better understanding of the relationship between extreme weather and cedar health. It may be possible at some point to quantify threshold levels of stress, induced by low spring rainfall combined with summer heat, that will lead to further cedar die-off in the ACFL.

Stress levels can be visualized as a function of weather using a scatter plot showing values for summer temperature and spring rainfall for individual years. The Cedar Mortality graph on this page shows those values for the twelve highest stress years since 1900, ranked by a numerical "stress index" that combines individual indices for summer heat and spring drought. The individual indices are on a scale of 0 to 100, where 0 represents the coolest summer or wettest spring and 100 represents the warmest summer or the driest spring. Yearly values are mapped onto this scale.

For example, the heat index for a year with an average summer temperature exactly at the midpoint between the coolest and warmest summers is assigned a value of 50. The overall stress index is then simply the average of the two indexes.

The Hypothetical Threshold represents the limit of higher temperature and lower rainfall that will lead to cedar die-off. Placement and shape of the threshold line is somewhat speculative at this point. It is drawn so that 2015 and 2016 are above the line while 2021 and 2023 are below, based on the observations that:



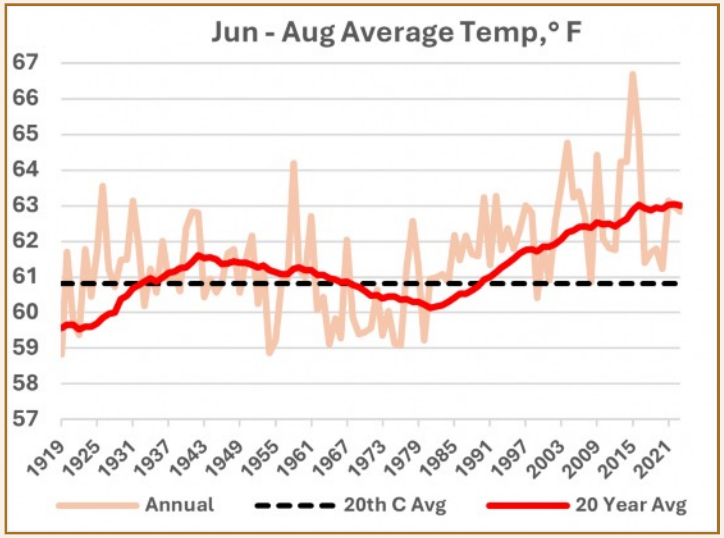
(1) large numbers of cedars died in Anacortes and elsewhere in the region in the years immediately following the two most extreme stress years, 2015 and 2016; and

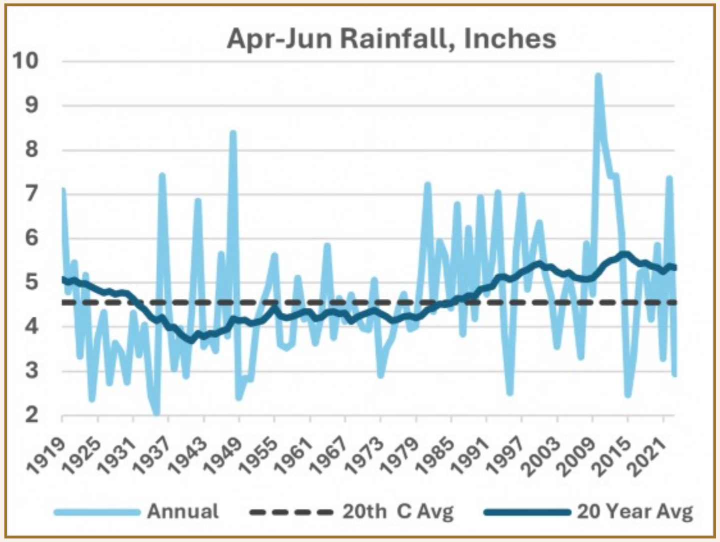
(2) we have not as yet seen any significant decline in cedar health in the field in the last few years.

Based on that experience, it is reasonable to predict that further die-off may occur when spring rainfall and summer temperatures are above and to the right of the line, especially if this happens in consecutive years, while cedars should survive when conditions are below and to the left of the line. Future observations will help us to more accurately quantify this threshold, perhaps more as a band than a line.

In terms of the "stress index", 2023 was the fourth most stressful year in our history. Although the hypothetical threshold as drawn in the graph puts 2023 below the critical level, 2023 could in reality be closer to the true threshold. If that is the case, subsequent stressful years could lead to more die-off.

While warming summers will certainly be more stressful for the trees, the increasing heat stress may be mitigated to some degree if spring rainfall also continues to increase.





Rainfall and Soil Moisture

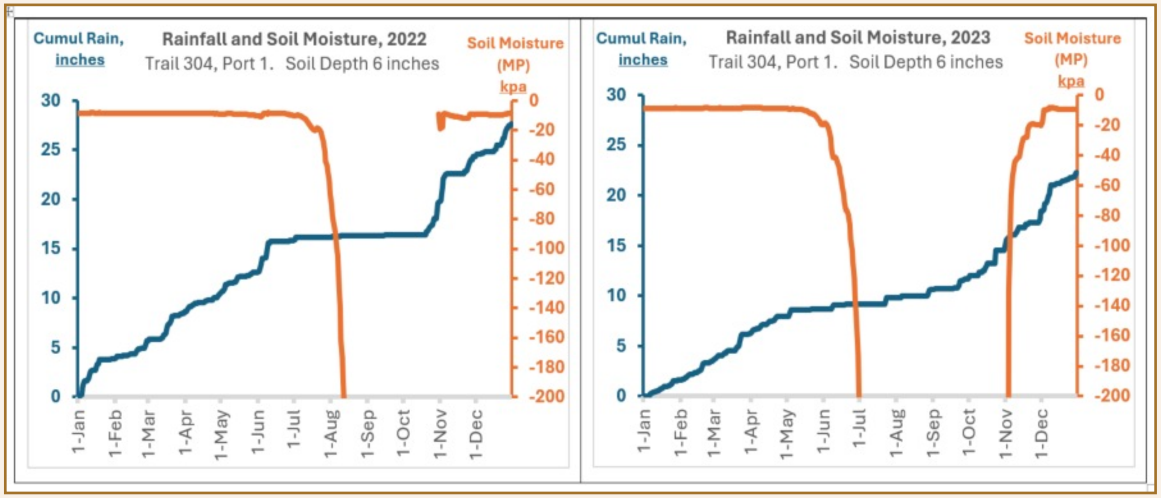
Another way to visualize drought-induced stress is to look at the soil moisture data that we have been tracking for the last few years in conjunction with the rainfall data. Because the spring of 2023 was unusually dry, the soil saturation profiles may be a good indicator of a near worst-case, particularly with the May-June rainfall being extremely low.

An illustrative example, comparing 2023 with 2022 using data from our monitoring site on trail 304 at the 6-inch depth, is shown below. The abbreviation MP on the vertical axis label stands for "matric potential", a technical indicator of soil moisture, with values at or near zero indicating that the soil is fully saturated. Moisture drops off rapidly as the matric potential reading falls to -100 and below.

The April through June period of 2022 was the eighth wettest since 1900, with May and June being the fourth wettest.

In 2022 the soil at this location retained a high level of moisture until late July, with the matric potential still above -100 on August 6. With the heavy rains starting in mid-October, the soil became essentially fully saturated by early November, reaching a -17 matric potential on November 2.

In 2023, the soil began drying out in mid-June, with matric potential falling below -100 on June 25. In spite of the higher rainfall in September and early October 2023, readings above -20 were not attained until late November.



Bird Surveys

By Neil O'Hara, Evelyn Adams, and Robbie Hutton

At this point we don't have a good feel for trends except the usual seasonal variation in both species and numbers.

The short-lived cold snap in January this year did seem to drive many birds away--the waterfowl because the lakes were frozen, but even the woodland birds went AWOL for a while. We don't remember seeing this in past years when we have had cold spells so we're not sure why this one was different.

In general, we see peak numbers in May and June when all the birds are singing and the summer visitors have either arrived or are passing through. We typically hear more species than we see all year round, except for the waterfowl, although waterfowl become harder to see in summer when the foliage in Big Beaver Pond grows out.

We know that having these baseline numbers will be critical in the coming years if or when we see and hear the changes in our environment as evidenced by the avian life that graces our forest lands.

Bird surveys aren't just about numbers or varieties, but even more about coming into a slower, more deeply focused way of being in the world. Glimpsing birds through their seasonal rhythms of breeding, nesting, molting, and migrating involves patient observation, putting clues together, and delighting in a growing knowledge, as well as being humbled and intrigued by doors of our knowledge still closed.

Our Bird Monitoring Volunteers:

Neil O'Hara, Evelyn Adams, and Robbie Hutton

A big thank you for your monthly surveys of birds in the ACFL, every month, all year long!

Do you know these four bird species?

(Answers are below)

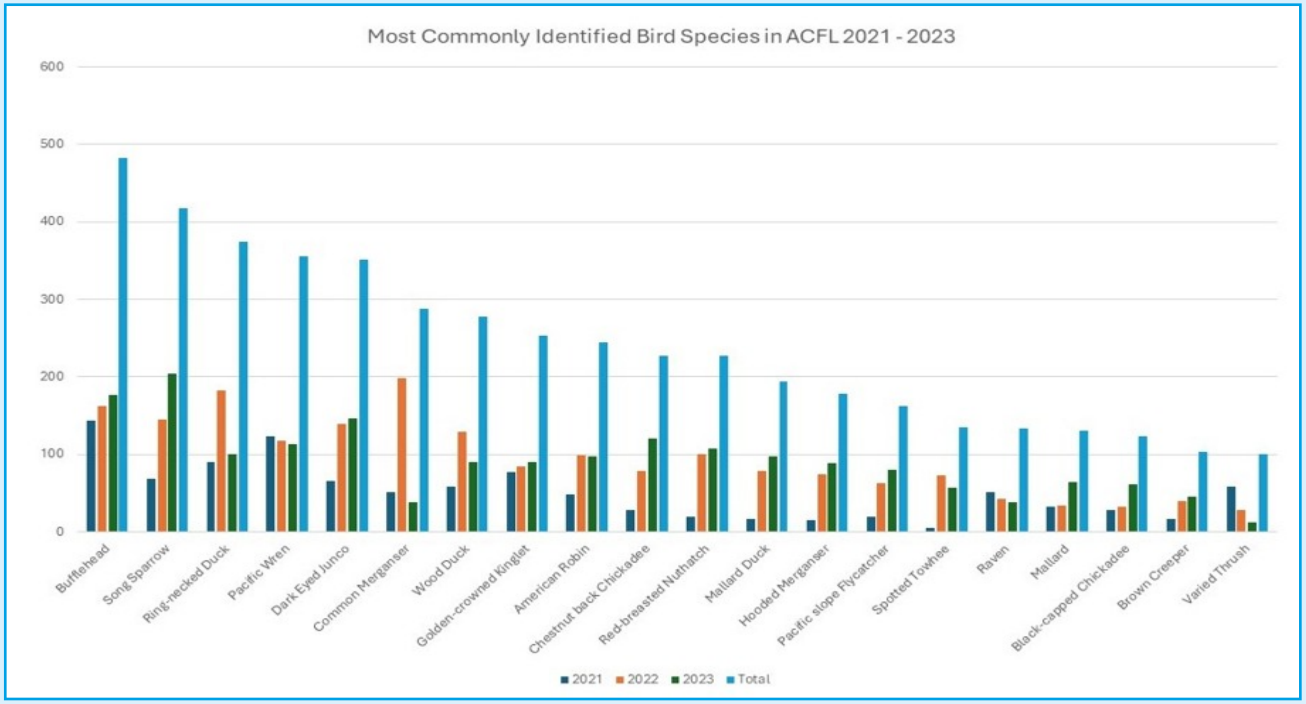
Top: Wood ducks, male and female
Middle: Spotted Towhee in a cedar
Bottom: Red-breasted Sapsucker
Center of page: Osprey

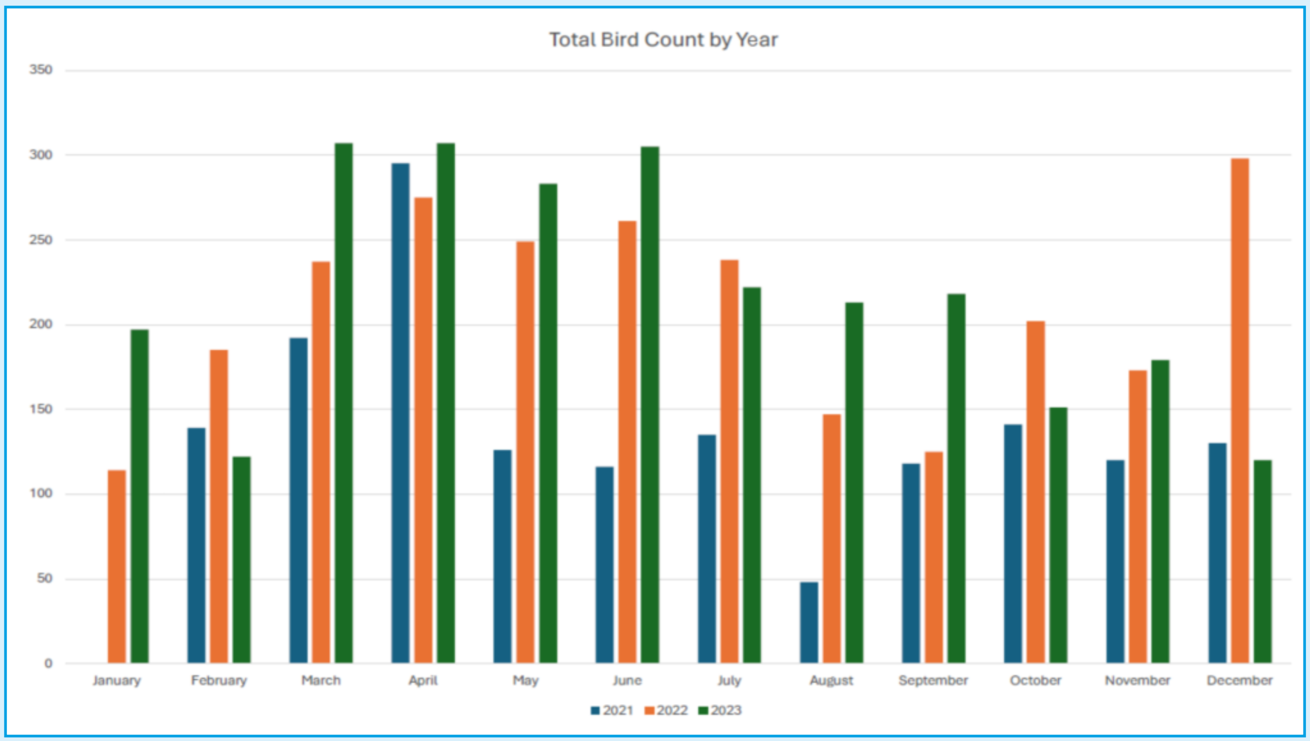
Center-of-page photo by Jack Hartt
Right three photos by Neil O'Hara.

A common question on the minds of forest hikers is: what are the birds that I see and/or hear in the forest?

Our bird monitoring teams have compiled a record of who we've heard and seen over the past three years.

The top graph shows our most common birds in the ACFL; the bottom graph shows how the number of birds in the ACFL rises and falls with the seasons.





Turkey vulture
Photo by Jack Hartt

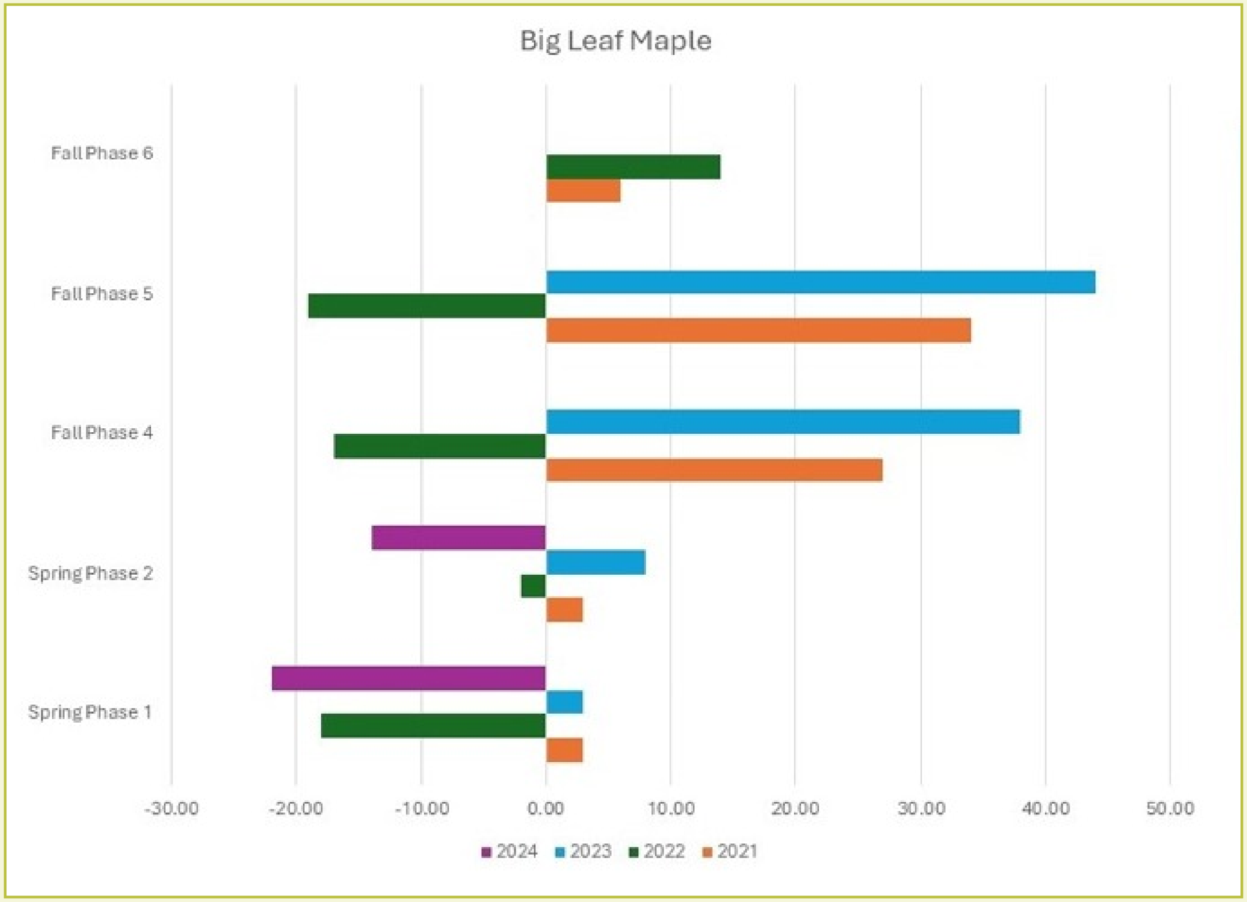
Phenology

By Taft Perry

Phenology is the scientific study of periodic biological phenomena in relation to climatic conditions. Indicator species representative of the ACFL plant community have been selected for long-term monitoring of their annual lifecycle events. The species being monitored are: Indian Plum, Ocean Spray, Salmonberry, Bigleaf Maple, Douglas Fir, Red Alder, and Western Hemlock.

Bigleaf Maple is the focus of this year's report. Looking at the data we have accumulated so far for Bigleaf Maples, it's not hard to see that the spring events appear to be trending earlier overall, and markedly so in the spring of 2024.

However, there is no obvious changing pattern in the fall events, but more years of data will likely change that story.



This graph shows the changes in the start of each phenology phase. Zeros indicate the first recorded instance in 2020. Bars to the left of zero, or negative, indicate an earlier occurrence; bars to the right, or positive, indicate a later occurrence.

2024 data is incomplete for the later phases will be recorded in the fall of this year.

Some interesting things happened in our phenology study this year, in particular with the bigleaf maples we have been observing since fall of 2020. This spring, we encountered something we had not seen before. Three of the four trees we study had flowers on them this year, while in previous years there were no flowers. These bigleaf maple flowers give the impression of a bunch of golden grapes drooping down.

Then we looked around the ACFL and saw these maple flowers at almost every maple we saw as well as all over Anacortes. We checked in with the lead scientist on the project, Dave Peterson, who reported that 2024 was an exceptional flower bloom year for maples and that he had seen them on a recent trip all along I-5 between Skagit and Olympia. That led to discussion about why this was the first year finding flowers on our study trees. Apparently mature healthy maples should put out flowers with some regularity.

But our study maples are atypical in that they were required to have three branches low enough that observers could both see and photograph them. As a result, our trees tended either to be quite young or outliers that had been damaged or somehow stunted in the past and were growing low branches. A more typical maple has an upright trunk with plenty of foliage up high, but few or no low branches.

After some thought, we concluded that it really doesn't make sense to study these non-representative maples since we are observing to see if there are climate changes affecting bigleaf maples in the ACFL. So, we have decided to drop the maples we've been watching and try to identify three or four more typical maples. This likely means we will have to use binoculars to look for budbreak and leaf expansion, and we'll have to look at the whole tree rather than individual branches.

Of course in some respects it's frustrating that we aren't going to continue with our original maple trees. But now that we have learned more about both bigleaf maple trees and about our ability to make observations, finding new trees seems like a better approach for this phenology study.

Phenology 2023 Volunteers:

Ruth Bachrach, Rob Adler, Shirley Hoh, Dan Miner, Jan Hersey, Sarah Roberts, Martha Hall, Keith Magee, and Peter Heffelfinger

Thank you for your dedication in monitoring and documenting the annual lifecycle events, which often require multiple trips per week to capture during the sprouting, growing, and fall seasons.

Volunteer Shirley Hoh photographs an emerging Indian Plum flower against her clipboard.
Photo by Jack Hartt

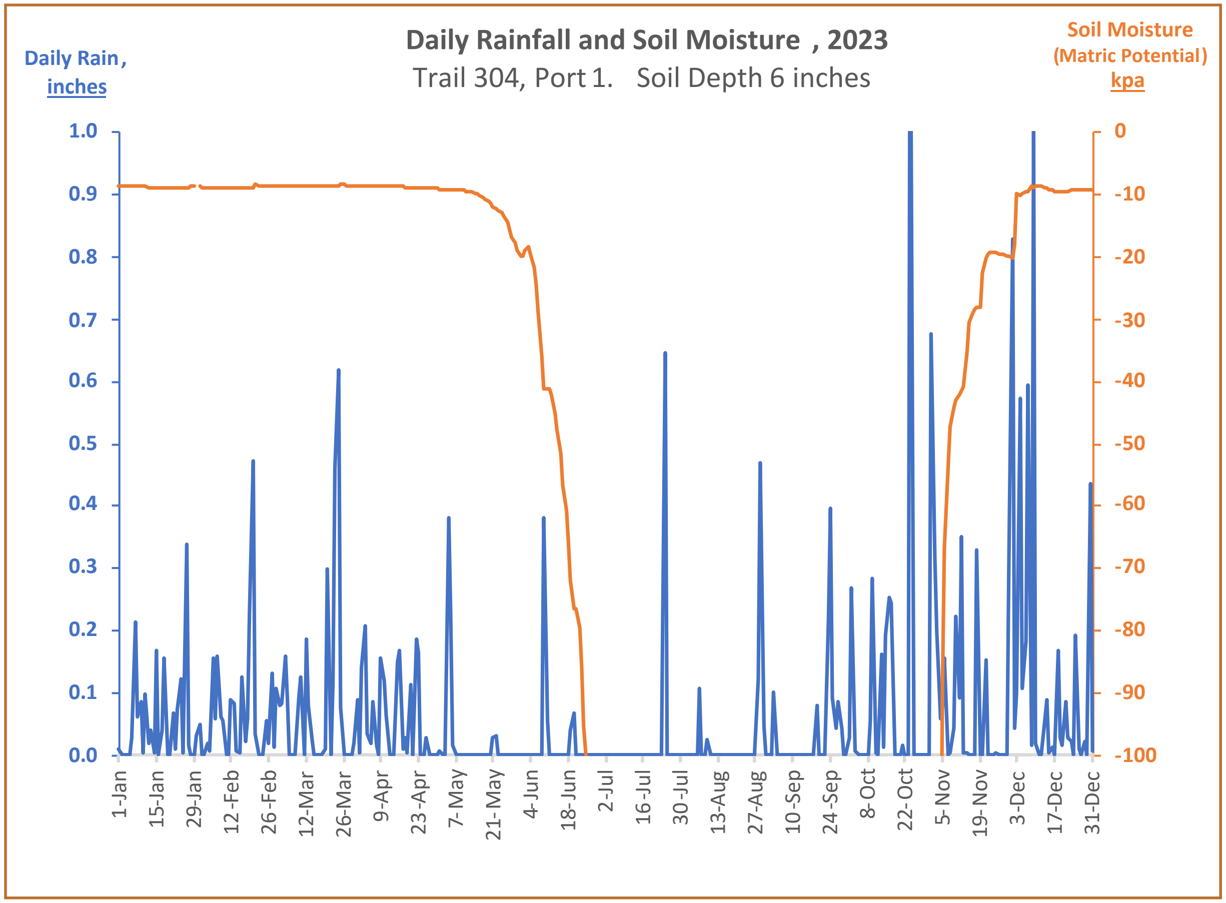
Soil Moisture

By Eric Shen

The soil moisture project records the data at varying soil depths (from 6" down to 60") at two locations: one on Trail 201 and the other on Trail 304. It is highly likely that soil moisture will have a significant influence on the health of the ACFL plant species and will help explain the changes observed in the forest over time.

Soil moisture conditions are recorded daily and stored on local data loggers, which are then downloaded twice a year. This data is then plotted along with the rainfall data to understand the correlation between the two. As would be expected, the rainfall and soil moisture are closely tied. However, from approximately June to the middle of September, intermittent rainfall does not change the dry soil conditions at the 6" soil depth. Plants begin wilting below -100 kiloNewtons per square meter (also called kilo-pascals, abbreviated as kPa) soil moisture readings.

Soil moisture readings at depths below -6" exhibit a similar profile, but the dry-out of the soil begins later. At the -30" depth, the soil drops below -100 kPa in mid August and late September at the -60" depth. Also, the time duration where soil moisture levels remain below -100 kPa shortens, moving down the soil moisture column until at the -60" level the total duration is 30 days (versus four months at the -6" level). This means that shrubs and trees that have roots that can reach below -30" will experience shorter periods where water is difficult to extract.



Weather and Climate

By Jon Ranney

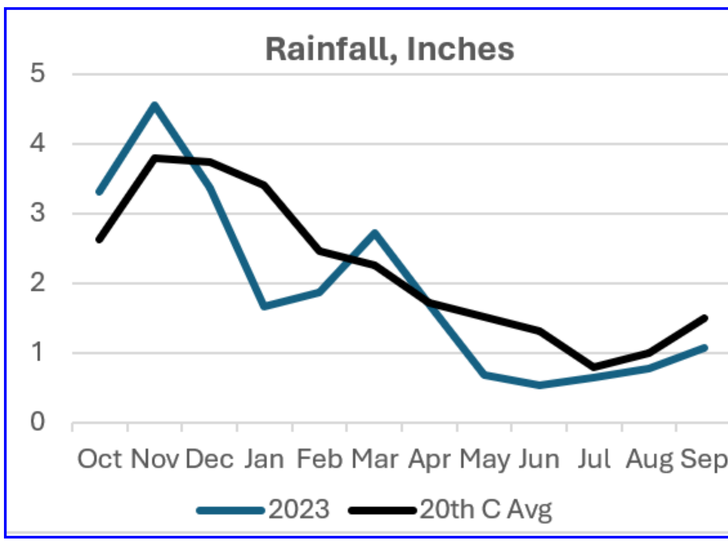
Following an extremely wet 2022, 2023 was quite dry. Total rainfall for the year was 23 inches, in the bottom 25% of all years since 1900. Rainfall during the critical April through June period was 2.9 inches, the second driest spring since 1995. Only 1.2 inches fell in May and June. Summer (June through August) was also dry, with only 1.9 inches, continuing the trend toward drier summers observed since the late 1990s.

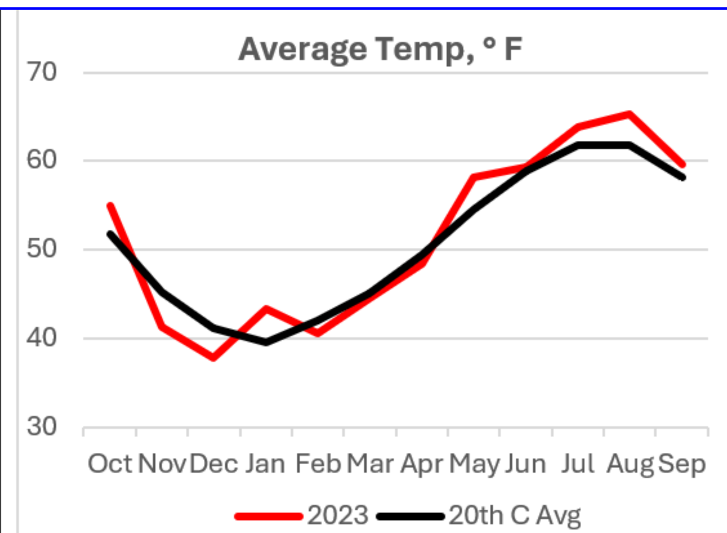
The average temperature for the year, 51.5°, was above the 20th century average of 50.8°, but below the 21st Century average of 52.2.° The average summer (June – August) temperature was 62.8, above the 20th Century average of 60.8° but in line with the 21st Century average of 62.9°. Summer temperatures were well below the four consecutive extreme warm years 2013-2016 when summer temperatures averaged 65.0°.

2023 Summary

	2023						20th C Averages			
		Temperatures, ° F						Temperatures, ° F		
Month	Rain, Inches	Avg High	Avg Low	Avg*	Max	Min	Rain, Inches	Avg High	Avg Low	Avg
October	3.3	62.0	48.1	55.0	72.1	42.0	2.6	59.1	44.4	51.8
November	4.6	46.4	36.3	41.3	55.1	28.2	3.8	51.1	39.5	45.3
December	3.4	42.0	33.7	37.9	56.6	13.5	3.7	46.4	36.1	41.2
January	1.7	47.5	39.4	43.4	57.4	26.7	3.4	44.8	34.3	39.6
February	1.9	45.1	36.2	40.7	53.1	23.6	2.5	48.3	35.9	42.1
March	2.7	50.8	38.3	44.6	62.6	32.3	2.3	52.2	37.9	45.0
April	1.7	54.4	42.4	48.4	70.2	35.9	1.7	57.7	41.3	49.5
May	0.7	66.6	49.7	58.1	85.7	43.2	1.5	63.5	45.6	54.6
June	0.5	67.6	51.2	59.4	81.3	46.4	1.3	68.2	49.4	58.8
July	0.6	73.6	54.0	63.8	83.4	49.9	0.8	72.1	51.5	61.8
August	0.8	74.3	56.2	65.3	86.3	51.4	1.0	72.0	51.7	61.9
September	1.1	67.3	52.0	59.6	78.4	44.3	1.5	67.2	49.3	58.2
Year	22.9	58.1	44.8	51.5	85.7	13.5	26.1	58.5	43.1	50.8

**Average temperatures approximated as average of high and low*





Fire Effects and Forest Dynamics

By Jon Ranney and Eric Shen

In 2016, a fire ravaged 17 acres of the ACFL just east of Little Cranberry Lake. Residents and hikers looked upon the landscape with concern and sadness over the damage caused by the fire.

In the years since the fire, the forest has been transforming from a burned landscape to an area that is once again lush and inviting. It is an example of how the ACFL plant species have evolved to survive in environments that periodically see fire.

The diversity of species in areas burned by the 2016 fire is vastly greater than in the areas untouched by the fire. Without the competition found in a normal forest, seeds that have long been dormant and/or come into the burn area post-fire have flourished. Over time, the dominant plants will out-compete the others, or perhaps a changing climate will favor the newcomers.

The evolution of the recovery has been interesting to observe. The first plants to return were not those that were in abundance prior to the fire. Pacific Madrone is a notable example of an early recovery species.

By 2019, when the first photo surveys were conducted, madrone seedlings were seen throughout Trail 103. Though madrones are present in the unburned areas, they are found as an occasional individual and not in large patches as seen in the recovery areas.

Pacific madrone sprouting in the burn area.
Photo by Jon Ranney

Our Fire Survey Volunteers:

Jon Ranney, Paul Sherman,
Robin King, Tom King,
Tom Strawman, Terry Slotemaker,
Ellie Kravets, and Eric Shen.

Transition Fidalgo thanks our fire survey volunteers of 2023 for their help in documenting the recovery process.

Forest Canopy Assessment

By Robbie Andrus

Existing forest monitoring projects, such as the Forest Dynamics and Health project and the Western Redcedar Mortality Project, provide detailed knowledge of changes in forest conditions, such as the number of newly dead trees, for a small area relative to the extent of the ACFL.

To complement existing projects, we launched a new project in Spring 2024 to better understand the overall forest conditions over time in the ACFL (and several other forested parks in Anacortes). Our overall goal is to map the spatial extent of recent mortality and place recent mortality in context of longer-term changes in forest canopy conditions.

The two specific goals of the new project are to:

(1) map and quantify changes in vegetation cover (e.g., deciduous forest, conifer forest, dead trees, shrubland, and grassland) with aerial photos from the 1940s to the present (using 4 time points); and

(2) build a map of individual tree species by applying artificial intelligence and field data points of tree species to high resolution aerial photos from 2023. Maps will be validated with field surveys during the summer of 2024.

The map built from goal #2 will identify tree mortality hotspots and serve as a baseline for documenting future species-level changes in forest conditions over time. Maps from the Forest Canopy Assessment are expected to be completed by Spring 2025. Maps will be shared with the City of Anacortes and the public via an online visualization dashboard. The dashboard will also host results from other monitoring programs in the ACFL.

Stay tuned for outreach events. The new project and associated activities were funded by a grant from the Urban and Community Forest program of the Washington State Department of Natural Resources.

Summary

By Eric Shen

Looking back over the past 5 years of surveying the health of the ACFL, it is our volunteers that stand out as one of the program's outstanding successes. Most of have been with their projects for the entire length of the program's existence. They've worked steadfastly collecting data, making mid course changes and improvements to their projects, and analyzing what the data is telling us. It is because of their efforts that, at the start of the 2024 forest monitoring year, we are now able to make some observations that address long-standing questions concerning the health of the ACFL.

In the aggregate, our projects show the trees, shrubs, and ground cover plants are in stable condition. The western redcedars are not in decline, the section of forest that burned in 2016 is recovering well, and there is good diversity within our bird population. The analysis of the data suggests a hypothesis that the observations of dead and dying western redcedars are a unique event triggered by the high heat and low moisture events that occurred between 2015 and 2016. Since the monitoring program started in 2019, cedar health conditions have been stable.

The occurrence of the spring lifecycle events, such as budbreak and leaf-out seem to be happening earlier. The weather data collected shows that rainfall in 2023 was one of the lowest since 1900 (bottom quarter of all years since 1900). Temperatures in 2023 were well below the high temperatures seen in 2013 thru 2016. It should be noted that the 2015/2016 heat and drought event may have triggered a die-off of western redcedar and western hemlock.

Soil moisture and rainfall continue to be analyzed to look for patterns between precipitation and available soil moisture levels that stress the plant life in the ACFL. Recent studies suggest that low rainfall in the spring stresses western redcedar, which results in higher incidences of plant mortality.

This year a new project was kicked off to characterize how overall forest conditions vary over time in the ACFL. The hope is this project will provide a better overall understanding of the ACFL, while the existing projects provide detailed information for specific locations. The two approaches will complement each other to form a better picture of forest health.

The observations and hypotheses discussed in this document are based upon our 5 years of surveys. We'll have to see whether the next 5 years continue support these observations and hypotheses.

The ACFL Monitoring Program is a volunteer-driven citizen science program. Our volunteers are the heart that drives the success of everything we've been able to accomplish. If you would like to join our team or if you would like learn more about the program, please send us an email at: info@transitionfidalgo.org

Photo by Jack Hartt

Eric Shen

Jon Ranney

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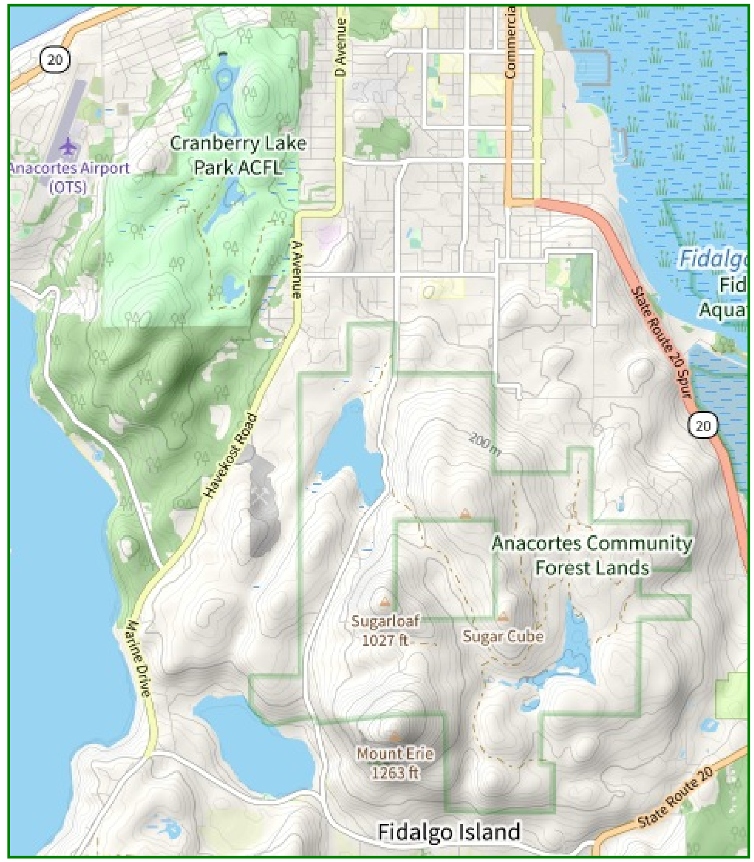
Individual Project Leads:

- Bird surveys: Jack Hartt
- Fire Dynamics: Jon Ranney
- Forest Canopy Assessment: Robbie Andrus
- Forest Plot Studies: Dave Peterson
- Phenology: Taft Perry and Ruth Bachrach
- Soil Moisture Studies: Eric Shen
- Weather and Climate: Jon Ranney
- Western Redcedar Mortality Project: Eric Shen



Scientist David Peterson assists volunteer Taft Perry in 2019, the first year of our program, as she measures a western redcedar in the ACFL.

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