



Newsletter

SPRING 2021

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Forests as Sinks

Using ground, airborne, and satellite data, a diverse team of international researchers – including NASA scientists – has created a new method to assess how the changes in forests over the past two decades have impacted carbon concentrations in the atmosphere.

In addition to better understanding the overall role of forests in the global carbon cycle, the scientists were also able to distinguish between the contributions of various forest types, confirming that among forests, tropical forests are those responsible for the largest component of global carbon fluctuations – both absorbing more carbon than other forest types, and releasing more carbon into the atmosphere due to deforestation and degradation.

While clearing land for agriculture, industry, and other human activities increases carbon dioxide in the atmosphere, the primary cause of the global carbon dioxide increase over the last century is from human activities that burn fossil fuels such as coal and oil. On balance, trees and other plants pull carbon dioxide out of the atmosphere.

The forest carbon flux map from web application Global Forest Watch, and the accompanying study published in *Nature Climate Change* on Jan. 21, show these carbon fluctuations from forests in unprecedented detail. This was published just one day after the United States rejoined the Paris Climate Agreement – an international effort to limit global temperature rise that specifically highlights reducing emissions from deforestation and forest degradation.

Through photosynthesis, forests absorb carbon dioxide from the atmosphere to produce oxygen, complementing the collective breath-

ing of other life on Earth that breathes oxygen and expels carbon dioxide. According to the researchers, forests collectively absorbed around 15.6 billion metric tons of carbon dioxide from Earth's atmosphere each year between 2001 and 2019, while deforestation, fires, and other disturbances released an average of 8.1 billion metric tons of carbon dioxide per year. Forests around the world are estimated to absorb about 7.6 billion metric tons, acting as a net carbon sink of roughly 1.5 times the annual emissions from the entire United States.

"Forests act as a two-lane highway in the climate system," said principal investigator Nancy Harris, who serves as the research director for the World Resources Institute (WRI) Forests Program. "A detailed view of where both sides are occurring – forest emissions and forest removals – adds transparency to monitoring forest-related climate policies."

This new methodology integrates datasets from numerous sources, including on-the-ground reports, aerial data, and satellite observations, to create the first consistent global framework for estimating the carbon flux specifically for forests. This is a change from the current annual reporting of national forestry data, which still varies between countries despite standardized guidelines from the Intergovernmental Panel on Climate Change (IPCC), often determined by the resources available in that region. Such a lack of uniformity in the data means that global carbon estimates can contain a sizeable degree of uncertainty.

"The good thing is that we know there is uncertainty and we can actually quantify it," says co-author Lola Fatoyinbo, a scientist

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EDITORIAL

The American presidential election, and its bizarre aftermath, resulted in a new president and Donald Trump being relegated to Florida golf courses. Add to that the fact that the big social media technology corporations have banned him from participating and we can conclude that we have seen the end of fake news, right? Not so fast. Lying and insisting on untruthful instances and circumstances did not begin with the ex-president and they will not end with his removal from office. This type of behaviour has existed, not only in politics, but in many areas of our society for quite some time now. Groups and individuals have distorted the truth, obfuscated, and outright insisted on lies to get their way.

This has been the case in the ecological domain as certain as it has been in other aspects of our lives. Whether talking about big issues or small some people use the strategy of declaring an unsubstantiated 'fact' and then repeating it and refusing to back down, even in the face of contradictory evidence. In that manner the fake information is granted the same standing as information verified by study, usually using the scientific method, and is allowed to influence that generally uninformed public.

A few of these large issues percolating in B.C. right now include the fictional idea that our provincial economy is dependent on our

Continued on next page...

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logging industry and that the industry can only exist through clear-cutting old growth forests and paying minimal stumpage fees. A second is one that has been perpetuated over the last decade and a half that the Site C Dam will be relatively inexpensive compared to the great deal of energy that will be supplied to British Columbian citizens. There is also the question of wolves and other apex predators effecting ungulate populations such as elk, caribou, and moose. Of course, the big one is that the Climate Change, that we are currently beginning to experience, is A) not occurring at all, B) is not due to human activity or C) is not able to be addressed because it will cripple our economy.

It turns out that, while it was once a driver of our economy, and more importantly a generator of jobs, the logging industry is now a much more minor player and is heavily subsidized. Profits that are generated from British Columbia forests go to industry share holders, often off-shore ones at that. There are some areas of the province that do depend largely on forestry but provided with assistance and control of their local forests, there is no reason why these communities cannot use sustainable practices to harvest a good living for their citizens. In this manner areas such as community water sheds can be properly maintained. Variation in the planting of substitute trees, moratorium on cutting the



old growth and properly maintaining ground cover for regeneration and fire control.

In terms of our electricity projections and the need for mega-projects like the Site C Dam it seems pretty obvious that the province was 'sold a bill of goods' when we were initially told about the cheap energy available from the construction of the dam and the displacement of people from their land. While the evidence is now available in hindsight, there were groups and individuals suggesting that the Christie Clarke government was not owning up to the complete story prior to the undertaking of this major investment. A question still out there is whether, or not, any excess hydro energy was really for B.C. or was intended to be sold to other jurisdictions.

Likewise, there is evidence, gathered from scientifically based studies, that wolves are not the major danger for caribou and other prey. In fact, in B.C. the major determinate of

caribou survival appears to be the dissecting of range by cutting logging roads through the habitat so that forests can be clear-cut. Wolves are not the trophy hunters of the wild, they consume mostly infirm and old animals when they do kill. It has also been shown that they are not habituating to cattle as was once assumed. The study in Yellowstone alone, has taught us that these creatures are required to make the whole ecosystem operate in a manner that has existed for thousands of years.

The Climate Change debate is really one sided with knowledgeable people that study these conditions overwhelmingly telling us that we have a problem. While the issue is far too large to go into here, suffice to say that Climate Change is occurring, and it is going to affect all of us and our families for generations into the future. There is no bigger problem.

Whether about all of the things that the federal government will take away if there is a national park, the importance of logging all of the wood before the insects get it, or how we really should allow motorized traffic on all trails in the spirit of share and share alike, we have lots of local issues to debunk too. It is up to us to seek information and educate ourselves and others about what we find. Ultimately, it is important to search out the information and make a critical, non-biased assessment of it when you are confronted with supposed conspiracies, unfounded opinions and other 'fake news'.

Rural Politicians Helping Flesh Out National Park

Federal officials sat down for a second virtual meeting this week with local politicians responsible for some of the areas proposed for inclusion in a new South Okanagan-Similkameen National Park Reserve.

"A number of questions regarding operational issues were discussed. While Parks Canada does have operational experience at other sites, and will share examples at future meet-

ings, the unique issues specific to the South Okanagan-Similkameen will be explored in detail through an extensive park management planning process held with local government and the public, after the proposed national park reserve is established," Parks Canada said in a press release.

"In response to concern from local residents over rumours of expropriation of land, Parks Canada confirmed once again that there will be no expropriation of land, Parks Canada confirmed once again that there will be no expropriation of private lands; any acquisition of private property will occur on a willing seller-willing buyer basis."

In attendance for the Regional District of

Okanagan-Similkameen were Cawston director George Bush; Rick Knodel (rural Oliver); and chair Karla Kozakevich. Staff from the RDOS and senior governments were also present.

Parks Canada is also meeting with the B.C. Government and local First Nations leaders.

The proposed park, which is still years away from opening, would cover about 270 square kilometres over a finger-shaped area roughly between highways 3 and 97 from Keremeos to the Canada-U.S. border. It's centred on Mount Kobau, and described as a national park reserve to acknowledge First nations' claim to land inside its boundaries.

...Forest as Sinks continued

from NASA Goddard's Space Flight Center in Greenbelt, Maryland. "All estimates come with an uncertainty around them, which is going to keep getting smaller and smaller as we get better datasets." The biomass estimates for the study were based on data from NASA's Ice, Cloud, and land Elevation Satellite (ICESat), which was primarily designed to track changes in ice sheet coverage but also provides topography and vegetation data.

Going forward, NASA's Carbon Monitoring Systems Biomass Pilot, which combines satellite and field data to improve estimates of vegetation and carbon stocks, NASA's ICESat-2, and the Global Ecosystem Dynamics Investigation (GEDI) – a laser-equipped instrument aboard the International Space Station that records the three-dimensional structures of the world's temperate and tropical forests – are expected to further improve understanding of carbon removal rates across forest landscapes going forward. As part of

the GEDI team, Fatoyinbo says they will be making multiple relevant data products such as tree canopy profiles and global maps of aboveground biomass that will be useful for making future carbon estimates.

"This is kind of a major shift in the paradigm of monitoring forests," says Sassan Saatchi, a scientist at NASA's Jet Propulsion Laboratory in Southern California and a co-author of the study. "It brought in a new picture of where the big changes are happening, in terms of both the land surface losing carbon to the atmosphere and also absorbing carbon from the atmosphere." The new approach also helped identify which forest types have higher uncertainties, highlighting tropical forests, as well as temperate forests in the Northern Hemisphere. "Where the uncertainties are large, that's where we need to focus and get more data to quantify better," Saatchi says.

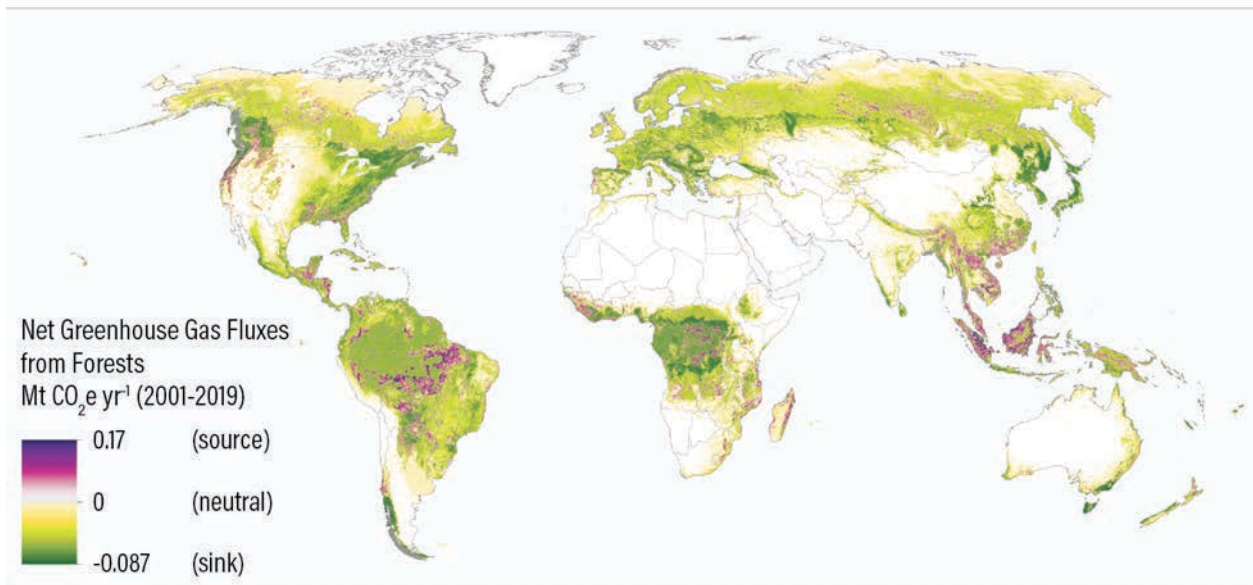
Once new data are available, it is relatively easy to crunch the new numbers. "The way this was set up is in a cloud computing plat-

form," says Fatoyinbo. "If there is a new dataset that comes out that is much better than was previously available, you can just go in and swap it. This used to be something that took years to do, and now you could do it in a few hours."

While the outputs aren't expected to change significantly, the uncertainties will shrink, providing scientists with a clearer picture of the global carbon cycle and helping to inform policy makers. For example, the study shows that 27% of the world's net forest carbon sinks are found within protected areas, such as national parks. Governments looking to reduce their emissions need data that is as accurate and current as possible. Fatoyinbo says that "this is one framework that can really help with that."

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Forests: Carbon Sinks or Carbon Sources?



Source: Harris et al. 2021
20.01.21



WORLD RESOURCES INSTITUTE

Carbon Sink -- World map showing forested regions that are sources of carbon emissions (purple) and where they are carbon sinks (green). Credit: Harris et al. 2021 / Global Forest Watch / World Resources Institute

Forestry doesn't pay the bills, folks

BY DAVID BROADLAND
JULY 3, 2020

Over the past 10 years, it cost British Columbians \$365 million per year, on average, to allow forest companies to log publicly-owned forests.

ONE OF THE GREAT ENDURING MYTHS told about BC's forest industry is that "forestry pays the bills, folks." Those are the exact words a *Vancouver Sun* reader used recently to dismiss a report by three BC forest scientists that urged the provincial government to put an immediate moratorium on further logging of large, old-growth trees. That reader's view? No can do. Forestry pays the bills.

The *Sun* reader didn't say whose bills; perhaps forestry pays *his* bills. But this rationale—that the forest industry is of such great economic importance to BC that nothing should be done to disturb its operations—has been used for decades as proof that any change in direction on public forest policy would be foolhardy. That may have been true 40 years ago, but those days are long gone.

Over the past 10 years, for example, the cost



Most of BC's "working forest" is now a giant patchwork of logging roads, clearcuts and young, fire-vulnerable plantations. For that dubious environmental result, BC citizens are paying more to manage the destruction than they receive in direct payments from forest companies for the wood extracted.

to the public purse of managing BC's publicly-owned forests has exceeded all direct revenue collected from the forest industry by \$3.65 billion. BC taxpayers are, on average, providing a subsidy of \$365 million each year to forest companies that operate in BC.

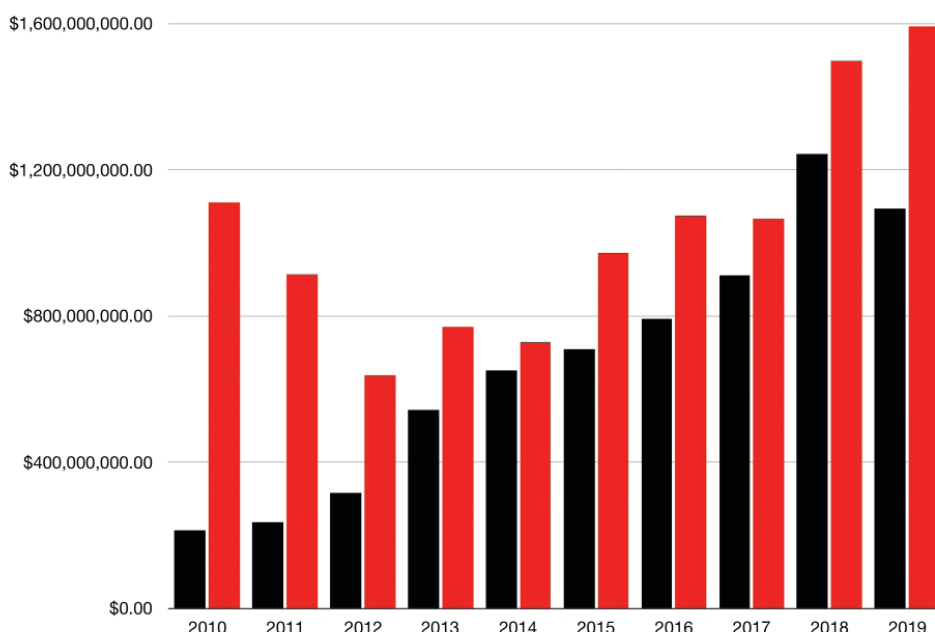
That figure of \$3.65 billion is derived from publicly available accounts published by the Province of BC. Those accounts show that, on the revenue side, BC collected \$6.41 billion in stumpage between 2009 and 2019. It also collected about \$300 million through

the BC Logging Tax. Together they produced revenue of \$6.71 billion. On the expense side, figures published in annual Ministry of Forests *Service Plan Reports* over those 10 years show total expenditures of \$10,363,595,000. That works out to an accumulated loss of \$3,652,460,667. Forestry doesn't pay the bills, folks.

Perhaps one of the reasons this basic fact about the forest industry—that it doesn't pay the bills—is widely misunderstood by the BC public is that detailed accounts of forest-related revenue and expenses for a given year never appear in the same document, at least not in public. Determining these numbers would be a daunting task for any curious citizen. For example, to obtain a detailed account of stumpage revenue collected by the Province over the past 10 years, *Focus* needed to download and sort through 3,617,486 lines of data from the Ministry of Forests' Harvest Billing System.

There are, of course, other gauges of the economic benefits generated by the forest industry that ought to be considered in an examination of the claim that "forestry pays the bills, folks." The forest industry—which includes forestry, logging and support industries, pulp and paper manufacturing, and wood product manufacturing—has long trumpeted its contribution to this province's exports. The value of those exports, of course, belongs to the forest companies that produce them, and there's nothing to prevent those companies

BC Ministry of Forests annual Revenue and Expense 2010-2019



from investing profits from those exports outside of BC. Vancouver-based Canfor, for example, recently announced majority acquisition of Vida Group, a Swedish forest products company. Canfor has also invested in Alberta, North and South Carolina, Alabama, Georgia, Mississippi and Arkansas. With the globalization of BC forest companies, we just don't know whose bills are being paid by raw log and wood product exports.

A more reliable indicator of the overall economic importance of the forest industry to BC is its contribution to the provincial GDP. For the eight years between 2012 and 2019, according to BC Stats, the economic contribution of the forest industry accounted for an average of 2.6 percent of provincial GDP. That includes all the road-building, felling of forests, transportation of logs to mills and log export facilities, and all the milling into wood products at lumber, panel, pulp, and paper mills. In each of those eight years, the annual growth in overall provincial GDP—none of which came from the forest industry—was larger than the entire output of the forest industry. Over those eight years, the forest industry's contribution to GDP shrank 25 percent. By 2019 it accounted for only 2.1 percent of provincial GDP.

Not only does the forest industry not pay the bills, its economic importance to the health of the provincial economy is getting smaller and smaller each year. This trend is evident in employment statistics, too. In 2000, according to BC Stats, there were 100,400 people employed in the forest industry. Those jobs accounted for 5.2 percent of BC's labour force. By 2019, that had dropped to 46,100 jobs, or 1.8 percent of all jobs. If that rate of decline continues, the remaining jobs will be gone by 2031. To keep those 46,100 jobs going, the Province has provided the forest industry exclusive access to 25 million hectares of British Columbia. At current employment levels, that works out to 5.42 square kilometres of publicly-owned working forest for each forest-industry job.

The records *Focus* obtained from the forest ministry's Harvest

Billing System allowed us to determine the actual cut and compare that with the official Allowable Annual Cut. The data shows a 22 percent drop in the actual cut in 2019 as compared with the average cut over the previous nine years. This decline occurred before the coronavirus emerged and, given the global recession that's been triggered by the virus, the amount of forest cut in 2020, and the number of people supported by that cut, are likely to reach historic lows. A comparison of the reported volume harvested in the first six months of 2020 with the same period in 2019 showed a 21 percent drop across the province (down 27 percent in coastal BC). The troubled future many British Columbians have imagined would one day afflict BC's forest industry has now arrived.

The sustained losses to the public purse from the current management regime for publicly-owned forests might provide ammunition for those who would privatize the land base dedicated to logging. But there are good indicators that, after decades of over-exploitation of public forests, managing BC's forests primarily for timber extraction is a money-losing proposition. TimberWest and Island Timberlands, through Mosaic, their joint business management unit, have recently claimed that the value of logs in the BC market doesn't even cover the cost of logging. TimberWest and Island Timberlands want to export more raw logs offshore in order to make money. To get what they want they have curtailed their operations until the federal and provincial governments acquiesce, putting hundreds of workers in small

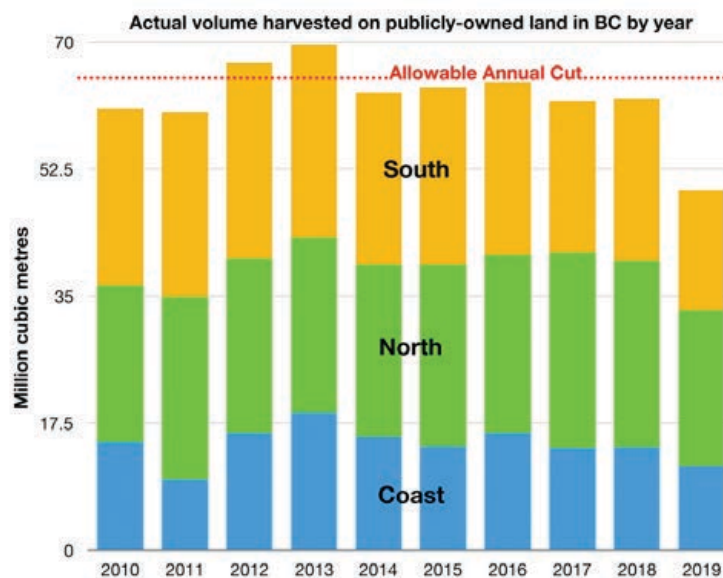
communities out of work. If timber extraction in BC has become such a marginally-profitable business, what would happen if the working-forest land base was privatized and there were no controls on what could be done with the wood extracted? Where is the public interest benefit in that direction?

A change that would be more beneficial to the public interest is suggested by data *Focus* downloaded from the Ministry of Forest's Harvest Billing System. For 2017, 2018 and 2019, we compared the value per cubic metre obtained by BC Timber Sales with that obtained from area-based tenures such as those held by TimberWest and Island Timberlands. BC Timber Sales uses a process of competitive auctions to market wood from public forests. Area-based tenures were established in the mid-20th century as a way of encouraging large forest companies to build mills in BC. Many of those mills have since closed and there is now no requirement for area-based tenure holders to operate manufacturing facilities to process wood logged from their tenures.

For all of BC for those three years, BC Timber Sales obtained an average value of \$37.33 per cubic metre. The average value collected from area-based tenures was \$13.32 per cubic metre, a third of what BCTS collected. Ending area-based tenures and expanding competitive auction of publicly-owned forests seems to be a much more certain way to protect the public interest, at least as far as the economic value of logs is concerned.

With an ever-increasing area of BC lying bare, stripped of forest by clearcut logging and clearcut-and-plantation fires—both contributing heavily to the climate emergency and biodiversity collapse—perhaps now would be a good time to envision a less destructive, more ecologically-enlightened relationship between humans and what remains of the forests of British Columbia.

David Broadland is spending the pandemic learning more about the forest he lives in and discovering the plants and creatures he shares it with. He can be contacted at focuspublish@shaw.ca.



NOTES FROM THE PAST

SPRING & SUMMER 2013

Queen's Diamond Jubilee Medal awarded to BC trail builder Kelley Cook Terje Vold

Former NTC regional Trails Coordinator For BC

The Canadian Trails Federation (CTF) awarded a number of Queen's Diamond Jubilee medals to its members across Canada for the part they played in the 2009 – 2010 federal trails funding program arranged through the National Trails Coalition (NTC), the CTF and, in BC, through the Outdoor Recreation Council. In BC Kelley Cook of Princeton was nominated for her outstanding contribution and a medal has been awarded to her. The following citation for Kelley's award was given by Terje Vold, the NTC's Regional Trails Coordinator for the program in BC, who had extensive dealings with all those in BC who built trails under this federal program.

Kelley Cook, Princeton, B.C. Cook was the project manager for the China Ridge Trails project from June 2009 to March 2010. This project received federal funding approval from the National Trails Coalition (NTC).

Kelley worked on the project on behalf of the China Ridge Cross-Country Ski Association located in Princeton, BC.

The NTC Regional Advisory Committee in BC reviewed all the applications, and the China Ridge trails project was one of the highest ranked non-motorized applications received. It had strong provincial support from the staff of Recreation Sites and Trails BC. The proposed trail improvements in the China Ridge area would benefit a number of non-motorized summer and winter trail activities including hiking, cycling, horseback riding, cross country skiing, snowshoeing, skijoring and dog sledding.

The NTC specifications for approved projects included the need for monthly reports, signage and local media coverage, ideally with elected officials. Kelley, on behalf of China Ridge, met and exceeded those expectations. For example, the monthly reports were not just progress on an excel spreadsheet about number of jobs supported, or trail improvements made, but included a quality description of the work done with detailed pictures noting progress. The event with the local MP received great coverage in the local media which could have been a challenge as the MP was from the opposition! Kelley not only delivered top quality results but did so in a timely manner, seldom having to be reminded, as was sometimes the case

with other project managers. When some additional funding opportunities became available to BC, Kelley quickly lined up other partners to match the federal funding so that additional trail work could be completed.

The community of Princeton can be thankful for Kelley's efforts as China Ridge provides both trail opportunities to the local community and it also attracts trail users from other areas who help support the community through their expenditures. The project completed nearly to 60 km of trail improvements including 17kms of newly built trail, 25kms of upgraded trails, and 16kms of rehabilitated trails. It was a pleasure to work with Kelley in my role as NTC Regional Trail Coordinator. She stood out in my mind as particularly deserving recognition for her efforts and I hope she will be able to receive a Queens Diamond Jubilee Medal for her hugely successful contributions.

SPRING 2013

The OSPS is pleased to unveil an updated and dramatic new logo. It replaces a black and white logo created in the 1960s that featured a mountain and trees. The new logo includes the society's name, and elegantly captures some significant and recognizable natural aspects of our region: the Mountain Bluebird, California Big-Horned Sheep, sagebrush, water and



Brent Mountain -- The aerial view of Brent Mountain. Notice the green crescent drawn on the photo, these are the boundaries of the protected portion of the mountain. Also notice the patches throughout the photo, these are the logged blocks that have been clear cut. This has occurred in the areas that have been under discussion for protecting from as far back as the RLMP negotiations that took place over two decades ago. Brent Mountain requires our effort to save what has been left.

NOTES FROM THE PAST

snow-capped mountain. Graphic designer Debbie Bowles (www.winkingowl.com) was selected to develop the logo. "The challenge was to take several key recognisable features of this varied and intricate landscape and use the lines, colours and inter-connection of these elements to create a cohesive, elegant and classic design that will stand the test of time," says Debbie. "Hopefully this new identity will help strengthen the society's visual presence, becoming a familiar symbol that rep-resents the wide range of projects the society undertakes." To view the logo in colour, visit www.okanagansimilkameen-parksociety.com. It will also appear on our banner and in sponsored events publicity.

This letter was recently sent to the Summerland Council by Sheila White, an O.S.P.S. director and a resident of Summerland. Wouldn't it be wonderful if each of the Okanagan Similkameen communities were to receive and act on a similar letter. Something for you to think about (and do).

Portion of letter drafted by Sheila White to Summerland Council

MAY 2013

Summerland is an attractive small town that has a lot to offer tourists. But there could be another draw, which has not yet been fully considered. There are some old trails and pathways around, but there is potential to add to the list with a variety of offerings:

1. Peach Orchard – old, shady, easy hike up to the highway
2. Giant's Head – a long or short challenge depending on the starting point. Fantastic view.
3. Conkle Mountain – a good walk with nature viewings.
4. Garnett Valley – the Heritage Trail past the reservoir. An interpretive sign has been placed here.
5. Rattlesnake Mountain – good views and should have a dedicated trail if a subdivision goes ahead.

6. Lakeshore – partly done in Lower Town, should connect Crescent Beach to Trout Creek.

7. Trans Canada Trail – a wonderful non-motorized trail leading south to Penticton and east to Osprey Lake and on. Needs to have municipal assistance in firm designation. Volunteers have raised much money and spent hundreds of hours to produce this trail, including building fences and trestles where necessary. Horses and motorized traffic can easily use the nearby road. Municipal assistance is needed to support this long section (70 km) of Trans Canada Trail.

8. The walkways either side of the highway bordering Trout Creek. Different values east or west but both have great off-leash walks.

The OSPS has been assisting with trails: KVR, HBC Brigade, Oliver-Osoyoos and Trans Canada Trail for many years. It would be good to see Summerland realize its potential by encouraging walking and cycling tourism as well as opportunities for ourselves.

National Parks meetings continue with RDOS

Times-Chronicle Staff

Parks Canada recently hosted its second targeted meeting with specific Regional District of Okanagan Similkameen board members to provide an update on the proposed national park reserve in the south Okanagan-Similkameen.

The meeting addressed progress in the negotiation of an establishment agreement and a number of questions raised by local residents.

The meeting was attended by regional board chair Karla Kozakevich, and directors George Bush (Area B) and Rick Knodel (Area C), as well as staff from Parks Canada and the BC Ministry of Environment and Climate Change Strategy.

Parks Canada continues to advance negotiations on the proposed national park reserve with the government of B.C. and the Syilx/Okanagan Nation. However, delays in the establishment process have occurred as a result of the COVID-19 pandemic and the inability of the parties to meet face to face in negotiations.

The unique issues specific to the South Okanagan-Similkameen will be explored in detail through an extensive park management planning process held with local government and the public after the proposed national park reserve is established.

In response to concern from local residents over rumours of expropriation of land. Parks Canada confirmed once again that there will be no expropriation of private lands. Any acquisition of private property will occur on a willing seller-willing buyer basis.

Expropriation as a means to establish or enlarge national parks and national park reserves is prohibited by Parliament under the Canada National Parks Act.

Osoyoos Mayor Sue McKortoff said she and town council support the national park concept.

"I do know that there are a lot of issues that go along with it. And I know that people who like to recreate it in the woods, you know, people over in Cawston, and on that side of us are not nearly as concerned for or they're not nearly as pro as we are, but it depends which side you talk to. I think it's a very good thing for the south Okanagan to have this."

Knodel previously expressed concerns about the park's impacts on property owners, but said he is encouraged that the affected areas are finally at the table with the national park representatives.

Many Overheated Forests May Soon Release More Carbon Than They Absorb

New research suggests that, sooner than expected, trees may become carbon sources rather than carbon sinks, as a feedback loop of rising temperatures drives them to release more greenhouse gases.

BY BOB BERWYN – FREELANCER

January 13, 2021

Bob Berwyn an Austrian-based freelance reporter who has covered climate science and international climate policy for more than a decade. Previously, he reported on the environment, endangered species and public lands for several Colorado newspapers, and also worked as editor and assistant editor at community newspapers in the Colorado Rockies.

As the climate in the Rocky Mountains warmed at about double the average global rate in recent decades, rapidly spreading bark beetle outbreaks left millions of trees red and dead, part of an intensifying cycle of global warming impacts that decreases the amount of carbon dioxide forests can take out of the atmosphere.

The last decades have been filled with dire warning signs from forests. Global warming has contributed to thinning canopies in European forests and to sudden die-offs of aspen trees in Colorado, as well as insect outbreaks that are killing trees around the world. In many places, forests are not growing back.

New research shows that Earth's overheated climate will alter forests at a global scale even more fundamentally, by flipping a critical greenhouse gas switch in the next few decades. The study suggests that, by 2040, forests will take up only half as much carbon dioxide from the atmosphere as they do now, if global temperatures keep rising at the present pace.

The study, published Wednesday in *Science Advances*, analyzed more than 20 years of data from about 250 sites that measure the transfer of carbon dioxide between land and plants and the atmosphere—the way the planet breathes. Forests and the rest of Earth's land-based ecosystems take up about 30 percent of human carbon emissions, so any big change in that process is important.

The data show a clear temperature limit, above which trees start to exhale more CO₂ than they can take in through photosynthesis, said co-author Christian Schwalm, an ecologist and earth system modeler at the Woodwell Climate Research Center. The findings mark a tipping point, of sorts, at which “the land system will act to accelerate climate change rather than slow it down,” Schwalm said.

The study found that, while trees at different latitudes have different temperature thresholds, for many forest types that are important for absorbing carbon dioxide, photosynthesis peaks at 18 degrees Celsius (64.4 degrees Fahrenheit). But the data showed no limits on the amount of carbon dioxide they can release.

Plants typically absorb CO₂ and release oxygen, but they also “exhale” CO₂, particularly at night, when photosynthesis ceases due to the lack of sunlight. Forests also emit more CO₂ when they are stressed by increasing temperatures.

Continued warming will reduce photosynthesis and exponentially increase the amount of CO₂ trees release through respiration as they try to breathe enough to keep cool. That will turn many vegetated landscapes from carbon sinks into carbon sources within 20 to 30 years, accelerating climate change, the study concluded. The study also showed no signs that forests were able to acclimatize to the rising temperatures of the last two decades.

“For my money, the results are conservative, because forest die-offs are not factored into this,” Schwalm said of the potential for dying trees to increase CO₂ production even more as they decay, driving additional global warming. The findings were not totally unexpected, he added. Research going back

decades, including some of his own work in Canadian forests, shows, “Temperatures really drive the bus.” “Seeing such a strong temperature signal globally did not surprise me,” he said. “What I was surprised by is that it would happen so soon, maybe in 15 to 25 years, and not at the end of the century.”

‘We’re in Bigger Trouble Than We Thought’

The research shows how intensely global warming is affecting ecosystems, said co-author Louis Schipper, who studies soils at the molecular level at the University of Waikato, in Hamilton, New Zealand. Global warming is shifting the climate so fast that there will be no stable “new normal” for the foreseeable future, Schipper said. And if forests start exhaling more CO₂ than they take up, “we’re in bigger trouble than we thought,” he added.

“The time that ecosystems have bought us, when we should have been doing something about reducing greenhouse gas emissions, we’ve wasted it,” Schipper said. “All our figures show, we need to stop it now. How bad do we want it to get? That’s our challenge and choice.” Schipper said he connected with lead author Katharyn Duffy, an earth system scientist at Northern Arizona University, at a science conference a few years ago, where they compared notes about plant physiology. “The stuff she was showing was remarkable,” he said. “She looked at CO₂ changes in response to the different variables, like moisture, temperature and light, and developed a technique to pull out the temperature responsiveness.” That showed how temperature limits photosynthesis, but not respiration of CO₂, he added.

For the study, Duffy used that technique to analyze photosynthesis and respiration rates from the global Fluxnet database and found that photosynthesis dropped sharply

above the temperature thresholds in nearly every type of land-based ecosystem, even after taking into account other effects such as water and sunlight. In most temperate forests, the threshold is 18 degrees Celsius (64.4 degrees Fahrenheit), in tropical forests, 28 degrees Celsius (82.4 degrees Fahrenheit). "The Earth," Duffy said, "has a steadily growing fever, and much like the human body, we know every biological process has a range of temperatures at which it performs optimally, and ones above which function deteriorates." The results show that limit for plants, she said. The results are "truly scary, and not just for forests," Schipper said, "especially if you intersect that graph with food production areas in regions that don't have the wealth or infrastructure to adapt."

Compelling Data

Through the 1980s and even the 1990s, many scientists thought forests might be more resilient than they've turned out to be. Climate models suggested increased CO₂ would increase photosynthesis and global plant growth, which was sometimes described as the "greening of the planet." But the new study clearly shows there are limits, said United States Geological Survey ecologist Craig Allen, who has been studying forests for 41 years from a field research station in northern New Mexico. Allen was not involved in the study.

"We can see, in the last 20 years, we have reached temperature plateaus where photosynthesis stops," he said. "What I find compelling about it is, 20 years of observational data shows that about 10 percent of the planet's surface was crossing these thresholds during the warmest three-month periods of the year."

The new study suggests that figure will increase, with about 50 percent of the terrestrial biosphere reaching temperatures above the threshold that limits photosynthesis by mid-century. Some of the most carbon-rich

ecosystems, like tropical rainforests in the Amazon and Southeast Asia, and Russia and Canada's boreal forests, will be among the first to hit that tipping point, the study reported. Extreme events, like hot extended droughts, are becoming more frequent, "but those are going to be normal and the extremes are going to get more extreme," Allen said. "The forests of the planet are telling us, and individual trees are telling us what's too much. The planet is in trouble and we're not speaking loud enough."

Forests May Need Triage

The imminent and far-reaching changes to forests reinforce the need to save what can be saved and to determine what types of forest management might be most effective to slow the decline, said University of Arizona forest researcher Jason Field, lead author of another recent study that outlined forest management options in response to global warming. With many forests at risk from megadrought conditions, "Forest managers will likely need to consider novel, higher-intensity management practices at finer scales to help increase forest resistance," Field said. That study was published December 2020 in *Frontiers in Forests and Global Change*.

Acknowledging the scale of the change has led forest scientists to consider what they can do to respond, as the changes become more extreme, said co-author Dave Breshears, a forest mortality researcher, also with the University of Arizona. "What can we do to respond as changes become more and more extreme?" At this point, forest management options for hotter and longer droughts caused by global warming are "barely being integrated into forest management," he said. "This is our attempt to get the conversation rolling. If we're going into megadrought, we need to think smaller and more effectively."

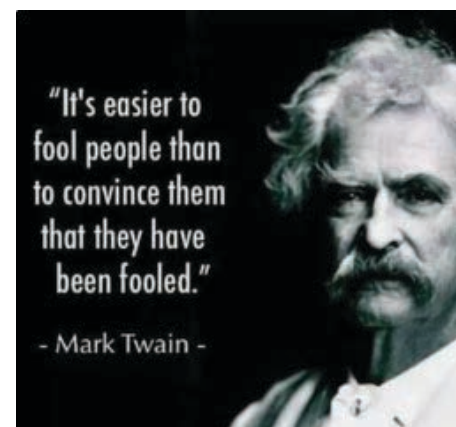
It may come down to looking at options for saving valuable, individual stands of trees, and protecting genetically distinct and more

resilient species. It could also be important to conserve corridors and patches of woodland to reduce the distance seeds must travel to enable forests of the future to spread or reconnect under more favorable climate conditions, he explained.

The new research on forest carbon uptake is really an enormous challenge to think about, he said, because we don't yet understand how to manage forests under hotter droughts. "We think a lot of these areas are going to go down, so where can we save some of it?" he asked.

"It's a different scale of problem and requires a different scale of thinking" he added. "The realization we can't escape the problem in full is not pretty, it's not optimal, and it's not where any of us want to be."

The new findings represent a tipping point because they suggest a dangerous feedback loop, said Phil Duffy, director of the Woodwell Climate Research Center, who was not involved in the study. "In this case the warming causes a change in net uptake of carbon by vegetation, which results in more CO₂ in the atmosphere, which reinforces the warming, and so on," he said. The findings challenge the possibility of limiting warming to 1.5 or 2 degrees Celsius. "In fact, it calls into question the assumption that the climate would even be stable at those levels of warming if all human greenhouse gas emissions were to cease, Duffy said. "At those levels of warming, emissions from vegetation would be sufficiently large to result in continued increases in atmospheric CO₂ and hence continued warming."



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Annual General Meeting

The 56th Annual General Meeting of the Okanagan Similkameen Parks Society will be held on Wednesday, April 28, 2021. Due to the continuing Covid -19 pandemic this AGM will be conducted via Zoom. Members and supporters will receive an invitation to the meeting accompanied by the log-in instructions.

Similar to last year's AGM the pro-

gram will consist of a working meeting and a slide show of activities and locations that the society has recently been involved in. We hope to be able to continue our informative educational presentations at next year's General Meeting.

For our members, supporters and other friends wishing to contribute to the ongoing work that the OSPS is engaged in

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Water Board Not Focused On Real Problem

Dear Editor:

A recent media release from the Okanagan Basin Water Board seems to suggest the OBWB has lost confidence in the 'control nature' worldview and is now advocating a 'work with nature' worldview in the floodplain of the Okanagan Valley.

The video accompanying their media release also appears to say the traditional engineering solution of constraining meandering streams into straight channels is no longer working.

This change in direction is also needed for "managing" forests in the watersheds of the Valley, to help control flooding, especially in this time of climate change.

Yet, there is not a word in OBWB's statement, about the hydrological effects of clear-cut logging in the higher Okanagan snow zone. More frequent, longer, and more severe flooding, extreme run-off, boil water advisories and ensuing droughts have all been attributed to clear-cuts.

Registered Professional Forester (RPF) and ecologist Herb Hammond, who has studied Peachland's watershed extensively, says that preserving the forest cover of Okanagan watersheds is integral to mitigating spring floods.

"It's even more critical, in those kinds of watersheds, to maintain cover to maintain late-season flow, otherwise you go from spring floods to fall droughts and that's becoming an increasing occurrence" says Hammond.

By neglecting to identify the role of clear-cut logging in watersheds, the OBWB is asking the B.C. government to remedy only the symptoms of poor ecological management. They

are not demanding ways to tackle the root causes of flooding in the Okanagan Valley.

Climate change will make things worse, but lowering lake levels is just a band-aid for the larger issue.

If the OBWB is sincere in requesting a review of how the Ministry of Forests Lands Natural Resource Operations and Rural Development manages Okanagan lake levels, they should start by addressing the volume of clear-cut logging operations permitted throughout the basin.

The Peachland Watershed Protection Alliance believes it's time the OBWB champions source water protection in a meaningful way. There is no such thing as sustainable clear-cut logging in a community watershed. This is why Vancouver and Victoria have worked to keep their watersheds protected against all industrial activities.

Jack Gerow, chairman, on behalf of the Peachland Watershed Protection Alliance