REVISED AGENDA
RESILIENT SAANICH TECHNICAL COMMITTEE
June ~~26~~ 28, 2022 at 6:30 p.m.
Via MS Teams

This meeting can be viewed/heard via MS Teams. Please note that callers are identified by their phone number which can be viewed on screen by all attendees at the meeting.

1.	**Territorial Acknowledgement**	Chair, T. Stevens	
2.	**Call to Order & Approval of Agenda**	Chair, T. Stevens	
3.	**Adoption of Minutes** • May 24, 2022 Meeting (attachment)	Chair, T. Stevens	
4.	**Receipt of Correspondence (if any)**		
5.	**Diamond Head Consulting Update on State of Biodiversity Report**	C. Cummings	30 mins.
6.	~~**Presentation on Private Land Stewardship Options**~~	~~D. Copley, Environmental Education~~	~~15 mins.~~
7.	**Decision on Milestone 3 Workplan**	Chair, T. Stevens	20 mins.
8.	**Decision on Secretariat Position**	Chair, T. Stevens	30 mins.
9.	**Reports from RSTC Working Groups** • Environmental Policy Framework (attachment)	Chair, T. Stevens	20 mins.
10.	**Evaluation Matrix/Evaluation Tool**	Chair, T. Stevens	10 mins.
11.	**Election of next RSTC Chair**	RSTC members	10 mins.

*** * Next Meeting: July 26, 2022****
Please email Nancy.Chaggar@saanich.ca if you are not able to attend.

MINUTES
RESILIENT SAANICH TECHNICAL COMMITTEE
Via Microsoft Teams
May 24, 2022

Present: Councillor Rebecca Mersereau (Council Liaison); Tory Stevens (Chair); Kevin Brown; Tim Ennis; Purnima Govindarajulu; Stewart Guy (Telephone); Chris Lowe; Brian Wilkes; Bev Windjack

Staff: Eva Riccius, Senior Manager of Parks; Thomas Munson, Senior Environmental Planner; Katie Turner, Park Stewardship Coordinator; Nancy Chaggar, Senior Committee Clerk

Regrets: Jeremy Gye

---

1. **CALL TO ORDER**

The meeting was called to order at 6:31 p.m.

2. **TERRITORIAL ACKNOWLEDGEMENT & DIVERSITY, EQUITY AND INCLUSION STATEMENT**

Councillor Mersereau read the Territorial Acknowledgement and the Diversity, Equity and Inclusion Statement.

3. **APPROVAL OF AGENDA**

MOVED by T. Ennis and Seconded by B. Wilkes: "That the Agenda for the May 24, 2022 Resilient Saanich Technical Committee meeting be approved as amended."

- Add 'OCP Update' to Councillor Mersereau's updates
- Add 'Receipt of Correspondence'
- Remove Environmental Policy Framework working group update

CARRIED

4. **ADOPTION OF MINUTES**

MOVED by K. Brown and Seconded by C. Lowe: "That the minutes of the April 26, 2022, Resilient Saanich Technical Committee meeting be adopted as amended."

CARRIED

5. **RECEIPT OF CORRESPONDENCE**

MOVED by B. Windjack and Seconded by T. Ennis: "That the correspondence be received for information."

CARRIED

6. **DIAMOND HEAD FIELD TRIP DEBRIEF**

B. Wilkes provided an update on site visits that occurred on May 8th and 10th with

Committee members, staff and Diamond Head consultants (DHC) and noted the following:

- The purpose of these site visits was to demonstrate risks and impacts to biodiversity.
- During site visits, the groups looked at: sites with unprotected species at risk; off-leash dog damage; deer damage; fenced versus un-fenced spaces; extent of invasive species in various parks; potential for biodiversity connections in neighbourhoods; and biodiversity enhancement in non-park natural areas.
- Current mapping discrepancies were communicated with DHC.
- These meetings provided an opportunity to clarify to the consultants what the Committee is looking for: understanding the current state of biodiversity and its risks/threats, and the delivery of a Report that is original and unique to Saanich which uncovers the unvarnished truth.
- Provincial standards should be used when assessing ecological conditions.
- Active management is required in order to protect natural areas.
- DHC will return for additional site visits.

In response to questions from the committee, the following was noted:

- Committee members emphasized the need for Provincial standards to be used for assessing conditions rather than DHC's own methods.
- It was expressed that DHC may choose not use Provincial Standards in certain circumstances because it may be limiting in an urban setting.
- The groups found evidence of damage as a result of dogs running through the underbrush at Glendenning Trail; *Friends of Mount Doug Park* have written to the District with concerns about the impacts of off-leash dogs.
- DHC will attend the June 28th RSTC meeting to provide an update on the mapping review.
- Through staff, the Chair will request a table of content for the State of Biodiversity Report from DHC prior to the content review which is due to occur at the August 23rd RSTC meeting.
- DHC is working towards a detailed scope of work as outlined in their contract.
- Staff indicated they may be able to share the contract with Committee members.
- It was conveyed that the contract cannot be changed.
- Aqua-Tex Consulting provided examples of their work to demonstrate riparian areas which could be used as corridor; DHC has indicated they are looking for these types of spaces.

7. RSTC WORKING GROUP REPORTS

C. Lowe provided a preamble for a Motion from the Stewardship Working Group; the following was noted:

- The consensus is that stewardship is largely focused on park lands.
- Staff don't have capacity to facilitate stewardship on private and non-park lands.
- Additional resources will be required to proactively work with homeowners to steward their land and adjacent non-park/public lands.

> **MOVED by C. Lowe and Seconded by S. Guy: "That the Resilient Saanich Technical Committee recommends that Saanich staff work with Resilient Saanich Technical Committee representatives to develop a business case for a new dedicated enhanced private and non-park-public land stewardship coordinator staff position in anticipation of the 2023 Saanich budget planning process."**

- The Stewardship working group is pulling together work that has been completed over the past year in order to prepare clear/formal recommendations which will come forward soon.

- Staff, Council, and the RSTC alike will have to balance financial commitments and priorities as the new budget planning cycle nears.
- Any new staffing requests require strong justification and planning.
- Enhanced stewardship will not come free.
- It was prompted that Bryn White had presented on establishment of a local conservation fund as a model to support enhanced stewardship.
- It was suggested that the Motion be tabled until after the staff presentation on Parks Stewardship.
- It was expressed that the stewardship fund may be presented as a separate Motion, as the existing Motion suggests it is for a business case.
- A Biodiversity Conservation Strategy is yet to come; ideas such as the conservation fund may be included as an action in the Strategy.
- The specific wording of 'coordinator' is not set in stone.

The Motion was then Put and TABLED

8. **STEWARDSHIP IN SAANICH PARKS**

The Park Stewardship Coordinator provided an overview on stewardship in Saanich parks and noted the following:

- Partnerships between community volunteers and District staff is vital to the environment and community.
- The District's official policy for environmental stewardship states: "Foster and support public awareness, engagement, and participation in community environmental stewardship initiatives".
- Various participants and partners are involved in park stewardship.
- The *Pulling Together* volunteer program includes over 200 lead stewards and volunteers who perform invasive species management and habitat restoration.
- The *Park Ambassador* volunteer program is comprised of 13 volunteers at Mount Douglas Park who provide education and outreach to the community. They contribute over 500 hours of volunteer time per year.
- Programs have seen steady growth in the last 20 years, other than a downfall in 2020 as a result of the COVID-19 pandemic.
- Many youth groups and schools are involved with stewardship in Saanich; this provides a good opportunity for knowledge sharing and inter-generational learning.
- Community outreach and education is a key component of the programs.
- There is increased interest and demand for volunteering.
- Succession planning is key to sustain these programs for the long term.
- The *Pulling Together* program is at capacity and has a waitlist of groups wanting to start new projects.

In response to the Parks Stewardship presentation the following discussions ensued:

- One goal of the *Park Ambassador* program is meaningful engagement with First Nations. Staff have facilitated training sessions with various First Nations community members to deliver their perspectives and ideas to program volunteers.
- The programs are limited due to coordination capacity. The Parks Stewardship Coordinator role is at full capacity and additional resources are required to expand the programs.
- Volunteer coordination requires onboarding of volunteers, as well as project planning and using best practices for a thoughtful approach to stewardship.
- There are various advocacy and stewardship groups in the community. Staff partner with some of these groups on certain projects.
- Staff work with the volunteer community to build capacity on monitoring and research projects.

- There is a gap for new non-park high value sites in the *Pulling Together* program.
- The current involvement of schools is due to keen individuals who take initiative. Staff hope to have a more fulsome discussion with District level staff about possible opportunities for stewardship partnerships.

CONTINUATION OF MOTION DISCUSSION – STEWARDSHIP WORKING GROUP

- It was suggested that the wording of the Motion be changed to 'position' as it is to develop a business case.
- It was suggested that wording be added in the Motion that highlights the fact that the Biodiversity Conservation Strategy is coming soon.

MOVED by C. Lowe and seconded by T. Ennis: "That the Motion be amended to revise the wording as follows:

- **Delete 'coordinator'**
- **Add to the end 'and to be ready to respond rapidly to recommendations anticipated in the upcoming Biodiversity Conservation Strategy'."**

Main Motion as Amended:

"That the Resilient Saanich Technical Committee (RSTC) recommends that Saanich staff work with RSTC representatives to develop a business case for a new dedicated enhanced private and non-park-public land stewardship staff position in anticipation of the 2023 Saanich budget planning process and to be ready to respond rapidly to recommendations anticipated in the upcoming Biodiversity Conservation Strategy."

CARRIED

9. **MILESTONE 3 WORKPLAN**

The Chair led a discussion on the work plan for Milestone 3 and noted the following:

- One of the final tasks in Milestone 2 is to draft a Milestone 3 work plan.
- The Chair suggested that a working group would be in order to review Milestone 3.
- The big piece that needs to be finalized in Milestone 3 is the Strategy.
- The Environmental Policy Evaluation Tool is another piece.
- More detail about the environmental portion of the Climate Plan is required, in addition to finalizing the enhanced stewardship program.
- The Milestone 3 Working Group will be comprised of: Chair, Tory Stevens; Kevin Brown; Brian Wilkes; and Councillor Mersereau (to help with process).

The Chair led a discussion on the Secretariat position and noted the following:

- There is support for a Motion to put out a contract to hire a stand-alone person to help the Committee.

MOVED by T. Stevens and Seconded by K. Brown: "That the Resilient Saanich Technical Committee (RSTC) recommends that the District of Saanich hire a third party consultant to work with the RSTC in writing its Environmental Policy Framework recommendations and enhanced stewardship report."

- There seems to be discrepancy across the Committee in terms of the Environmental Policy Framework (EPF) and what remaining work is intended.
- It was suggested that the Motion be tabled until the Milestone 3 workplan discussion

occurs.

- It was suggested that the Motion be amended by indicating that the Secretariat/consultant will work with the Committee to help with decision making around EPF recommendations and the enhanced stewardship report.
- The Secretariat is someone who may help with document management, calling meetings, setting dates, summarizing actions and discussions, performing data collation, tracking actions, and helping with moving towards timely decisions.
- It is unclear what is meant by "work with the RSTC in writing its EPF recommendations"; it was understood that this work is substantially complete and that the draft document would go to staff for implementation.
- The EPF outline has been completed substantially but it hasn't been filled in completely: it is missing input from First Nations, and some sections indicate that they are yet to be written. More work is required before the EPF goes to staff.
- It is unclear how the Secretariat would help the Committee to make decisions.
- It was suggested that the Committee may wish to write the scope of work for the Secretariat role.
- The Stewardship Working Group has written good information; it was expressed that members haven't found adequate time to compile the work.
- It was suggested that this written information may be provided to the consultant who will work on the Strategy as they will be providing the final recommendations.
- A scope of work for the Secretariat role will be drafted by a Committee member, and circulated for review, input, and consensus in the next few days.
- The Committee is to discuss the matter by email and a Motion will be brought to the next meeting, if necessary.

The Motion was then Put and TABLED

10. **PARKS UPDATES**

The Senior Manager of Parks provided updates from the division and noted the following:

<u>Parks Division Staffing Update:</u>

- The Environmental Services group has joined the Parks division since a couple of weeks.
- The work of Environmental Services staff continues to be the same at this point.
- Staff will take some time to learn about each other's work and work flows, and then will start looking at streamlining processes to find opportunities for growth.

In response to questions from the Committee, it was noted:

- The Conservation Strategy will provide some guidance on how to deal with private land management. If some form of Environmental Development Permit Application is implemented, then Parks will organize work processes accordingly.
- All functions that Environmental Services fulfilled under Planning (such as Streamside Development Permit Applications and reviewing potential for conservation covenants on private property) will continue.
- Private lands will not be left unattended with this change.
- This change was the CAO's decision based on the Planning department's need to focus on land use planning (housing), and to look at efficiencies between Parks and Environmental Services as there are a number of overlapping theme areas.

<u>Urban Forest Strategy Review Update:</u>

- Diamond Head Consulting (DHC) is performing data analysis using CRD mapping and analyzing the integrity of data and differences in canopy cover.

- It was anticipated that the first round of public engagement would occur in June; however, DHC wants to complete a draft State of Urban Forest report prior to public engagement.
- Over the summer, DHC will host an interactive map for the community to go online and make notations about why particular areas are significant or need more trees.
- Discussions have occurred about a joint consultation meeting with First Nations around conservation and biodiversity.

In response to questions from the Committee, it was noted:
- The RSTC will have an opportunity to engage with DHC on the Urban Forest Strategy Review during information sessions that will be offered.

11. COUNCIL LIAISON UPDATES

Councillor Mersereau provided updates on the following topics:

In-person Meetings:
- Committees now have the option to meet in-person.
- There is no option for hybrid meetings; they must be either in-person or virtual due to logistical reasons.
- It is at the Chair's discretion to determine how the RSTC will meet moving forward.

Marine Shoreline Mapping:
- Earlier this year, the RSTC passed a Motion recommending that Council include funding for mapping of the Marine Shoreline in the budget.
- It was confirmed that this funding was approved and included in the budget.

First Nations Relations:
- The letter that is being drafted for Eric Pelkey to invite feedback from the W̱SÁNEĆ Leadership Council (WLC) Environment Committee will come from the RSTC Chair.
- Discussions have occurred about inviting the WLC Environment Committee for a joint workshop with RSTC members to discuss biodiversity and trees. This may be a form of engagement for two important processes that are currently underway. Councillor Mersereau will provide further updates on this.
- Saanich sent letters to Songhees and Esquimalt First Nations to advise of corporate initiatives that are underway, including the work done by RSTC, in order to invite participation. Councillor Mersereau will report back on any responses received.

Official Community Plan (OCP) Update:
- The OCP is a guiding document that articulates the vision for the future through policy.
- Saanich's OCP is from 2008, and is recommended to be updated every five years.
- This will be a strategic/focused update of the OCP.
- The update has been endorsed by Council and work will occur over the next year.
- The OCP is the highest order policy document in Saanich, and the Environmental Policy Framework is a lens for operations across the Municipality.
- Councillor Mersereau raised the risk of not coordinating these two pieces of work with staff. A commitment was made to keep all parties informed as these projects move forward.

The following discussions ensued in response to the OCP Update:
- The RSTC's work is critical to the upcoming OCP updates. It will be important to ensure its outputs are integrated into the OCP as a fundamental piece.
- It was expressed that the most important elements to share with Council are the principles and goals, and the context that has been written by the RSTC.

CHAIR'S REMARKS

- The June 28th RSTC meeting marks the current Chair's last meeting for its six month term. Committee members are to think about who they wish to nominate as Chair for the next term.
- The Chair will email the group about action items coming out of this meeting.
- The Environmental Policy Framework will be sent in its current draft form to Council.

12. **ADJOURNMENT**

On a motion from B. Windjack, the meeting adjourned at 8:54 p.m.

NEXT MEETING

The next meeting is scheduled for June 28, 2022 at 6:30 p.m.

_____
Tory Stevens, Chair

I hereby certify these Minutes are accurate.

_____
Committee Secretary

Clarifying the breadth and depth of "environment" for the RSTC EPF report and EPF- a need to explicitly include abiotic components of environment and reference to public health

Kevin Brown RSTC

Draft for RSTC discussion and possible endorsement-in-principle 28 June 2022

The EPF requires a clear and comprehensive framing and description of "environment"

- How we view "environment" determines what policies we think are applicable and adequate.
- We vary in how we perceive "environment", based on our cultural upbringing, education, lifestyle, age, location and what we are exposed to, etc. Perceptions drive priorities.

Appropriate framing and description of "environment" in the EPF can:

- Broaden perspectives about "environment" and facilitate communication
- Help ensure important components and processes of "environment" are not overlooked when determining knowledge and policy gaps and priorities for action.
- Lead to better recognition of environmental impacts associated with development
- Account for emerging problems
- Help show linkages among environment, threats, and policy

Are our working definitions of "environment" adequate in Resilient Saanich-related documents?

1. **Saanich OCP** (cited in our working glossary): "environment" refers to "natural environment, including the physical environment (e.g., soil erosion, agricultural capability, unstable slopes, streams, flooding, groundwater, air quality, noise, contamination of land or water, stormwater runoff and aesthetics) and biological resources (e.g., birds, mammals, food chain effects, vegetation, biodiversity, loss or reduction of habitat, rare or endangered species, and rare or representative ecosystems)".
2. **Saanich EPF and Protecting the Environment webpages**: "natural environment" "*makes our community beautiful and enhances our wellbeing. In urban areas, it cleans our air and water, attracts birds and wildlife and moderates our climate"*.
3. **EPF working group draft EPF report**: "environment" denotes "*all the terrestrial and aquatic ecosystems and landscapes within Saanich and their associated components, functions, and processes*".

The Saanich descriptions touch on abiotic environment, biodiversity and ecosystems, and public health and wellness. Examples given are an assortment of environmental components, undesired effects of damage, and human uses. This is repeated in the draft environmental policy gap analysis.

The definition of "environment" in the draft EPF report is broad and covers what "natural environment" is normally considered to entail. Additional detail and emphases could better link "environment" to threats/impacts and policy in the Saanich context, i.e., what the EPF and gap analysis should be doing.

I propose that in our EPF report, we:
(1) define "environment" to explicitly include abiotic components of environment (in addition to their inclusion in the ecosystem-based definition)
(2) state that public health/wellness is related to abiotic environmental conditions **(a) directly** and **(b) indirectly,** the latter via effects on ecosystem condition and function and our accessibility to "nature".

The abiotic environment should include, at minimum:
air and water quality, sound, light, and air temperature. Soil is both abiotic and biotic.

Additional considerations:

- Inappropriate levels of abiotic factors may be bad for public health/wellness and for biodiversity and ecosystem functions in urban areas
- Levels suitable for humans may be unsuitable for other organisms (and vice versa)
- Saanich (and CRD) policies or bylaws already address some aspects of air and water quality, sound, light, and soil, but may do so in the context of public health/wellness.
- Public health is historically an important focus of environmental protection
- Abiotic factors are mappable and have been spatially linked to biodiversity and/or public health elsewhere. Mapping abiotic factors complements ecosystem mapping and is relevant for local land-use planning

Proposed specific additions for the RSTC EPF report:

Appendix: Brief (1-2p) notes on different abiotic components of environment, specifically: (1) light (2) sound/noise (3) air quality (4) soil (5) temperature. For each:

- What is it?
- How do we affect it?
- How does it relate to biodiversity and public health?
- Are there relevant local or regional data?
- How do local municipal (Saanich and CRD) policies /strategies currently address it?
- Is it mappable?
- Key references

Sample (draft) briefs on sound, light, air quality and soil are on following pages

Body of the text (to follow our existing general definition of environment):

- Simple conceptual diagram showing connections among people (impacts and public health/wellness) – abiotic environment -- biodiversity/ecosystems
- Paragraph expanding on what should be considered as “environment” in the EPF, referencing the conceptual diagram and briefs in the Appendix.

Sound and soundscape

Sounds are the physical phenomena originating when vibration from a source propagates energy into a medium as an acoustic wave. **Soundscapes** are the collection of sounds perceived in an environment, including sources that are biological (e,g., bird vocalizations), geophysical (e.g., wind, rain, water flow), or anthropogenic (man-made). Anthropogenic sounds are magnified, and biological and geophysical sounds masked, in urban soundscapes.

Sound is critical for animal communication and survival. Animals which detect key components of sound (intensity, frequency, timing) may better capture prey, avoid predators, establish territories, mate, and ultimately, reproduce (e.g., Turner et al 2018). Animal taxa differ in their hearing ranges and sensitivities (Newport et al 2014). Sounds generated by different animals can be recorded and analyzed to provide insights into biodiversity not provided by traditional visual surveys.

For humans, sound is vital for communicating and can provide a sense of place and well-being. A given sound can be considered desirable or undesirable, depending on the timing and source (Raddichi et al 2021).

Noise (pollution) is human-made sound that alters the behaviour of animals (including humans) and interferes with their functioning (Newport et al 2014). Common sources of outdoor noise pollution are road traffic, construction, industrial operations, and power equipment.

Noise can mask sounds critical to animal behavior and survival and, ultimately, impact biodiversity. Effects on biodiversity can be direct (e.g., predator-prey interactions) or indirect (e.g., through impacts on pollinators and seed dispersers). Some animals may change vocalization patterns in response to urban noise but the benefits of these changes to survival is unclear. Noise may also interfere with the use of sound recordings to assess and document biodiversity.

Noise affects public health (WHO 2018; Raddichi et al 2021); prolonged exposure may increase cardiovascular diseases, cognitive impairment, sleep disturbance, hyper-tension, annoyance, and lead to premature death. Conversely, reduced exposure to noise and increased exposure to sounds associated with natural landscapes (often masked by noise) can reduce stress (Buxton et al 2021).

Sound intensity decreases with distance from the source and can be reduced further by the presence of appropriate vegetation or hard barriers. Traffic-related sound intensity varies with type of traffic and increases with traffic speed (https://environment.transportation.org/education/environmental-topics/traffic-noise/traffic-noise-overview/)

Existing local and regional data for natural soundscapes, noise and noise impacts on local biodiversity
?? Not yet able to find data on noise intensities from Saanich or Capital Regional District

Current local or regional outdoor sound/noise-related policies and strategies
Humans and other animal taxa differ in their sensitivity to sound intensity at different frequencies; some animals may be more sensitive to sound frequencies typical of urban noises than are humans.

However, urban sound and noise-related policies typically aim to restrict noise considered directly detrimental to health of humans rather than to other organisms. What is noise pollution to non-human animals may not be perceived by humans as noise.

Municipal noise management policies are restricted in their scope, were written when population density was much lower, and do not incorporate recent findings pertaining to sound and noise effects on biodiversity and public health. Examples include:

- B.C. Ministry of Transport and Infrastructure. 2016. Policy for assessing and mitigating noise Impacts from new and upgraded numbered highways. [references passive parks where quiet is important, presumably to humans, but not necessarily ecosystems]
- Municipality of Saanich. 1992. Sound barriers in Saanich- general approach. Council Policy. [does not address effects of noise on ecosystems]
- Municipality of Saanich. 1993. Bylaw no. 7059. For abatement and control of noise in the municipality of Saanich. [does not address effects of noise on ecosystems]

Can soundscapes be mapped?
Soundscapes can and have been mapped. Data could be contained on a GIS layer. Appropriate mapping can be used to identify noise "hotspots" (e.g., near busy roads) and guide planning for new developments and mitigation to protect biodiversity and public health. Soundscape mapping would complement more traditional mapping of ecosystems and "natural" areas.

Locally, the Friends of Mount Douglas Park Society mapped in 2013 where, on park trails, car noise was "very loud", "significant", "distant", or "no" (not detectable). Other examples of soundscape mapping in rural and urban areas include Aletta and Kang (2015), Dein and Rudisser (2021), and Holgate et al (2021)

Stewardship opportunities
Community-generated measurements of noise levels using smart phone-based apps with appropriate calibration

Others?

References

- Aletta and Kang 2015. Soundscape approach integrating noise mapping techniques: a case study in Brighton, UK Noise mapping 2
- Buxton et al. 2021. A synthesis of health benefits of natural sounds and their distribution in national parks PNAS 118
- Dein and Rudisser 2021. Landscape influence on biophony in an urban environment in the European Alps. Landscape Ecol 35
- Holgate et al. 2021. Mapping ecoacoustic hot spots and moments of biodiversity to inform conservation and urban planning Ecol Indic 126
- Newport et al. 2014. The effects of light and noise from urban development on biodiversity: Implications for
- protected areas in Australia. Ecol Manage and Restoration 15
- Raddichi et al 2021. Sound and the healthy city. Cites and Health 5
- Turner et al. 2018. Sound-mapping a coniferous forest- Perspectives for biodiversity monitoring and
- noise mitigation. PLOSone 13
- WHO 2018. Environmental noise guidelines for the European Region. ISBN 978 92 890 5356 3

Light and lightscape

Light is radiation in a specific range of the electromagnetic spectrum. It is best described by its spectral distribution, which quantifies the amount of energy (or the number of photons) as a function of wavelength. "Visible" light wavelengths range from 380 to 780nm. Key attributes of light for life include duration (e.g., daylength), intensity and spectral quality.

Plants and animals have evolved behaviors in response to natural daylength, light intensity, and spectral quality because those light characteristics vary in predictable ways. Plant responses include productivity and phenological events such as shoot elongation and cessation, flowering, senescence, and germination. For animals, natural light affects foraging, reproduction, and predator-prey interactions. Starlight can guide animal migration (e,g, Sokol 2021). Human circadian rhythms are closely tied to daylength and exposure to natural light (Blume et al 2019]. **Natural lightscape** is that landscape and its components not affected by artificial lighting at night (**ALAN**) (e.g., US NPS). ALAN may be from outdoor sources (e.g., streetlights, outdoor signs, car headlights, etc.) or indoor sources visible outdoors.

Appropriate ALAN is essential to human safety and wellness and may be esthetically desirable (although it may interfere with humans' enjoyment of the night sky). New outdoor lighting technologies use electricity more efficiently than older technologies, potentially reducing costs and environmental impacts of electricity generation, while improving visibility and safety for humans. Spectral signatures vary with technology; a key concern is that spectral signatures overlap with the action spectra of biological processes (Gaston and Holt 2018). Increases in human population and associated ALAN mean a relatively small part of the planet is unaffected by ALAN, including skyglow (Kyba et al 2017).

ALAN may impact terrestrial organism function and biodiversity. For example:

- Increasing light pollution may be driving global declines in global insect populations; impacts on insects vary with species, light intensity, spectral distribution, direction, flicker rate, time of day and structure of surrounding surfaces (Owens et al. 2020). Lights from both stationary (e.g., streetlamps) and mobile (e.g. headlights) have significant impacts
- ALAN locally increases daylengths and, separately or in combination with urban heat island effects) may accelerate budburst in vegetation, predispose vegetation to frost damage, and alter interactions between plants and herbivores.
- ALAN may disrupt night-time migration of birds and lead to bird mortality from collisions with well-lit buildings (e.g., Beatley 2020); indirect effects on bird populations may result from ALAN's impacts on insects. Road lighting and traffic headlights may influence herpetofauna (amphibians, reptiles) behavior (Shilling et al. 2018)
- Relatively low levels of ALAN reduced mammal activity in Chicago green spaces. Importantly, the effects were detectable well within the largest green spaces (Schirmer et al 2019).
- Effects of different light intensities and spectra from ALAN vary with animal taxa.

ALAN may also affect fish and aquatic invertebrate behavior. Locally, concerns have been expressed about the effects of blue lights from the Johnson St. bridge on fish and invertebrate behavior (GWI minutes 18 May 2018 and attached correspondence).

Availability of Saanich or regional artificial light and lightscape data

A quick search did not locate data located for light levels throughout Saanich or the CRD, including their relation to biodiversity. However, public commentary on the CRD proposal to widen portions of the Galloping Goose and Lochside regional cycling and walking trails identified potential impacts of

supplemental trail ALAN on wildlife, particularly near Swan Lake, and recommended appropriate mitigation. Similarly, public concerns were expressed about possible impacts of lighting from the proposed Telus Ocean building in downtown Victoria on birds (https://www.cbc.ca/news/canada/british-columbia/victoria-telus-ocean-building-bird-strikes-1.6319854).

Existing Saanich outdoor lighting-related policies and regulations

Street lights 1978. Council policy directing use of sodium luminaires in future street lighting

Outdoor lighting for municipally-controlled buildings and structures. 1992. Council policy restricting hours of outdoor lighting within 5 km of the Dominion Astrophysical Observatory, recommends use of sodium lights and shielding and lenses to minimize stray light.

Sign Bylaw No. 8789 including *Schedule A, Municipal Outdoor Lighting Standards for the Control of Light Pollution.* 2006. Regulates type, timing, shielding of outdoor lights, particularly within 5km of Dominion Astrophysical Observatory. The bylaw references building design and stray light with respect to the Observatory. but **not** effects on natural areas, biodiversity, and ecosystems.

Others?? Other Saanich Engineering outdoor lighting policies?

Can lightscapes be mapped?
Lightscapes can and have been mapped elsewhere. Appropriate data could be incorporated as a layer in the Saanich GIS and used to assess potential impacts of development on biodiversity "hotspots", and guide updating of Saanich outdoor lighting standards and appropriate ongoing ALAN mitigation.

Stewardship and policy opportunities to minimize impacts of outdoor light on animals

- Review ALAN light levels and lighting standards (type, location, duration) with respect to biodiversity "hotspots"
- Develop "bird-friendly" design **requirements** that minimize "bird-attractive" ALAN for multi-story buildings
- Encourage or regulate minimizing visible lighting from office buildings at times critical for birds
- **Encourage** appropriate ALAN in single-family residences to minimize insect mortality, bird collisions with windows

References

- Beatley 2020. The bird-friendly city. Island Press
- Blume et al. 2019 Effects of light on human circadian rhythms, sleep and mood. Somnologie 23:147
- Gaston and Holt 2018. Nature, extent and ecological implications of night-time light from road vehicles. J. Appl Ecol. DOI: 10.1111/1365-2664.13157
- Kyba et al 2017. Artificially lit surface of Earth at night increasing in radiance and extent. Sci. Adv. 3: e1701528
- Owens et al. 2020. Light pollution is a driver of insect declines. Biol Conserv 241: 108259
- Schirmer et al. 2019. Mapping behaviorally relevant light pollution levels to improve urban habitat planning Sci. Reports. 9:11925
- Shilling et al. 2018. Wildlife-Crossing Mitigation Effectiveness with Traffic Noise and Light Res. Rep., Natl. Center Sustainable Transportation

Urban soil

Soil is the natural material that occurs on the land surface, is comprised of mineral and organic solids, liquid, and gases, and is characterized by (1) horizons distinguishable from the original material due to additions, losses, transfers, and transformations of energy and matter and/or (2) the ability to support rooted plants in a natural environment (e.g., NRCS Soil Survey Staff 1999. Soil Taxonomy)

Soil is the unseen ecosystem in the terrestrial landscape. In urban settings soil is heavily modified, poorly characterized, and often viewed through its engineering properties, i.e., its physical characteristics and ability to support the successful installation of buildings and hard infrastructure. However…

Soil physical characteristics and soil organisms together regulate carbon, nutrient, and water cycling. This affects ecosystem carbon uptake and sequestration, soil fertility, and site water balance (water absorption, retention, evaporation, and runoff). Soil provides habitat for terrestrial vegetation and animals and affects the functioning and diversity of associated aquatic habitats. Soil biodiversity is likely far greater than in other components of terrestrial ecosystems (Pouyat et al. 2010). While poorly described, soil biodiversity is critical to carbon and nutrient cycling and to above-ground biodiversity.

Healthy urban soil provides critical ecological goods and services, can reduce the need for grey infrastructure, and supports biodiversity and potentially, urban agriculture.

Urbanization can directly or indirectly affect soil quantity, quality, and function. Stressors include:

- topsoil removal (and possibly replacement)
- soil compaction
- soil sealing (paving)
- removal of vegetation
- deposition of fill/waste materials, including soil from construction sites and application of sludge
- chemical contamination (e.g., fuel oil spills)
- introduction of invasive soil fauna

Potential **consequences** of stressors for soil composition, structure and function

- Fewer horizons / shallower B and C horizons (Herrman et al 2018) and disrupted profile
- Alteration of subsurface water movement
- Reduced soil carbon and organic matter throughout profile; greater clay contents
- Increased compaction; reduced porosity, and permeability
- Reduced root growth and water retention; increased stormwater runoff
- Increased water- and wind-driven erosion
- Higher concentrations of contaminants, including heavy metals, persistent organic chemicals, nutrients from over-fertilization
- Reduced suitability of soils for local food production, tree growth

The quality of degraded urban soils may be improved by appropriate management practices.

Human health may also be directly impacted by exposure to airborne soil particles (e.g., dust), chemical contaminants (for example, heavy metals and persistent organic chemicals), and soil-borne biota such as bacteria and fungal spores. Exposure pathways include inhalation, skin contact, and ingestion and consumption of plants grown in soil (e.g., Li et al 2018).

Soil-associated fungal-caused diseases include “valley fever” (coccidioidomycosis), associated with the US Southwest and Central Valley of California, but recently found in south-central Washington (Washington Department of Health), and cryptococcosis, first found on Vancouver Island in 1999. Humans and other animals may also ingest Toxoplasma oocysts, distributed largely through domestic cat feces, and cause toxoplasmosis; healthy ecosystems may be able to filter out the parasite and reduce exposure (https://www.cbc.ca/news/canada/british-columbia/cats-spread-deadly-parasite-1.6244761)

Bylaws and provincial legislation related to municipal soil management

Saanich Soil Removal Bylaw 5576. 1996.
Saanich Deposit of Fill Bylaw 9204. 2013.
Saanich Oil Burning Equipment and Flammable Liquid and Combustible Liquid Fuel Tank Bylaw 9700, 2021 (Amendment to Bylaw 9265, 2014)

CRD and provincial policies pertaining to soil applications of biosolids

Province of BC Bill 3, Environmental Management Amendment Act, 2020. Regulates the quality and movement of soil associated with development

Have Saanich soils been mapped?

Soils of Greater Victoria were mapped as part of the 1959 Soil Survey of Southeast Vancouver Island and Gulf Islands, British Columbia. Soil profiles and characteristics have not been mapped since.

Heavy metal concentrations in soil were measured at many sites in Greater Victoria, including Saanich) from 2016-2019 and mapped (Greater Victoria Compost Education Centre https://gze.maps.arcgis.com/apps/View/index.html?appid=16d53a8f8f824cfd94256f4a8cdad9dc)

Fill prohibition areas are shown on the Saanich GIS

References

- Herrman et al. 2018. Widespread loss of intermediate soil horizons in urban landscapes. PNAS 115:6751
- Li et al 2018. Urban soil and human health: a review. Euro. J. Soil Science
- NRCS Soil Survey Staff 1999. Soil taxonomy.
- Pouyat et al. 2010**.** Chemical, physical, and biological characteristics of urban soils.
- Washington Department of Health. https://doh.wa.gov/you-and-your-family/illness-and-disease-z/valley-fever-coccidioidomycosis

Air quality

Air pollutants are those gases and particulates that impact human health and ecosystem function when exceeding certain levels.

Air pollutants include primary and secondary particulate matter (PM), ground-level ozone (O_3), nitrogen and sulfur oxides (NO_x, SO_x), carbon monoxide, volatile organic compounds (VOCs), persistent organic pollutants such as furans and dioxins, ammonia (NH_3) and heavy metals such as mercury. PM matter (PM) is divided into PM2.5 (particle diameter<2.5microns) and PM10 (<10microns) for monitoring and regulatory purposes.

Many pollutants (e.g., some PM, NH_3, CO_2, CH_4) occur naturally, but human activity can generate excessively high levels and impact ecosystem processes and public health.

Other compounds such as O_3 are significant air pollutants at ground level but their presence in the stratosphere is essential to protecting life from solar UV radiation.

Human activities are responsible for many pollutants of concern. Individual pollutants arise from different sources. Many pollutants are produced directly by combustion or decomposition of organic substances including liquid fuels, municipal and agricultural wastes, and forest biomass (wood heating or forest fires). Other pollutants (CH_4, refrigerants, VOCs) occur when leaked into the atmosphere; still others (ground-level O_3) may result from secondary reactions with other atmospheric chemicals. Emissions of VOCs from asphalt-based materials (paving and roofing) may be a significant source of urban air pollution (Khare et al. 2020).

Air pollutants are often associated with urban and industrial activity. Intensive agriculture may produce air pollution via N fertilization, animal waste production, cultivation, and field burning. Forest fires generate pollutants which impact urban environments and residents' health (NASEM 2022); fire frequency and magnitude is increasing with climate change. Particulate matter includes dust, pollen, and spores; these occur naturally but may be exacerbated by human activity and be locally important.

Pollutants differ in their persistence and the geographic scale of their impacts; some are especially important locally while others may disperse over wide areas.

Air pollution directly and indirectly impacts biodiversity and ecosystems. Well-documented examples include effects of air pollution on lichen diversity and tree growth; acid rain and N deposition on soil and water chemistry and ecosystem productivity; and ground-level O_3 on crop productivity. Indirect effects include impacts of (1) stratospheric O_3 – depleting chemicals on biota via increased UV exposure and (2) high levels of greenhouse gases (e.g., CH_4 and CO_2) on ecosystems via changes in seasonal temperatures, precipitation patterns, nutrient cycling, insect and plant pathogen dynamics, etc.

Air pollution strongly affects human health, including respiratory and circulatory diseases, diabetes, and cognitive development (Ali 2022). Effects on public health were noted in ancient Greece and Rome (Fowler et al 2020). Protecting public health was the initial impetus for modern regulatory control of air pollution. For example, the UK's Clean Air Act of 1956 arose from the 1952 London smog disaster which killed several thousand people. In the US, the first federal legislation intended to "control" air pollution was the Clean Air Act of 1963, with associated programs located within the US Public Health Service.

Air pollution varies across urban areas; municipal policies can directly affect how much air pollution residents are exposed to. Pollutant levels may be consistently higher near industrial operations and heavily trafficked roadways and lower in areas with greater tree canopy cover (e.g., Cummings et al. 2021). This suggests that **zoning, development policies, green space and urban forestry initiatives, etc. can affect exposure to air pollutants**.

Residential buildings can also be a significant source of urban air pollutants. In residential buildings, heating source impacts both indoor and outdoor air quality. A significant portion of fine particulate emissions in Metro Vancouver come from wood-burning stoves and fireplaces. Natural gas-powered appliances (stoves, fireplaces, space and water heat) produce ultrafine particles and NO_x and if not well-ventilated, reduce indoor air quality and impact resident's health. Even if well-ventilated and efficient, gas appliances emit significant amounts of CO_2; natural gas infrastructure can leak significant amounts of CH_4 both indoors and outdoors. Hence, numerous North American cities are now banning natural gas hookups in new residential construction. Locally high concentrations of CH_4 from leaky outdoor gas mains connections can also affect street tree health (Schollaert etal 2020). **Municipal building codes and engineering policies can reduce air pollutants associated with residential buildings**.

Local bylaws related to air quality

Monitoring and regulation of air pollution is largely under the jurisdiction of the provincial government through the *Environmental Management Act* and associated regulations

Local regulations pertaining to air quality include:

- Saanich Fire Prevention Bylaw 8807, 2006. Regulates outdoor burning.
- CRD Clean Air Bylaw 3962, 2014. Regulates smoking in outdoor public spaces.

Air pollution can be mapped at fine scales in urban areas with the development of mobile air quality sensors and incorporated into the Saanich GIS (e.g., Cummings et al. 2021 https://air.health/https://air.health/https://air.health/https://air.health/)

References

- Ali 2022. What exactly is air quality, and what affects it in BC? Beyond- People, ideas, and actions for a better world. UBC Brand and Marketing. https://beyond.ubc.ca/what-is-air-quality-and-what-affects-it-in-bc/
- Cummings et al. 2021. Mobile Monitoring of Air Pollution reveals spatial and temporal variation in an urban landscape. Front. Built Environ. 7:648620
- Fowler et al. 2020. A chronology of global air quality. Phil. Trans. R. Soc. A **378**: 20190314. https://doi.org/10.1098/rsta.2019.0314
- Khare et al. 2020. Asphalt-related emissions are a major missing nontraditional source of secondary organic aerosol precursors. Sci. Adv. **6**: eabb9785
- National Academies of Sciences, Engineering, and Medicine 2022. *Wildland fires: Toward improved understanding and forecasting of air quality impacts. Workshop Proc.* https://doi.org/10.17226/26465
- Schollaert et al. 2020. Natural gas leaks and tree death: A first-look case-control study of urban trees in Chelsea, MA USA. Env Poll 263:114464.