Notes/Report from Habitat Restoration Monitoring Workshop (October 4, 2022)

sponsored by Habitat Conservation Trust Foundation - Caribou Habitat Restoration Fund

Workshop Background:

Habitat Conservation Trust Foundation (HCTF) has the responsibility to deliver the Caribou Habitat Restoration Fund (CHRF) that is supported by the Province of BC and Canada. HCTF has faced challenges developing and promoting a practical monitoring regime to measure performance of the CHRF. To help address this challenge, HCTF hosted a workshop of caribou habitat restoration practitioners, government regulators, and fund administrators to discuss monitoring.

The **objective for the workshop** was to advance a more consistent use of monitoring tools and techniques to assess caribou habitat restoration projects.

To enable a consistent context to the discussion on monitoring, the workshop opened with a framing discussion on monitoring. Some underlying principles discussed included:

- As caribou are adversely affected by human disturbance, **any effort to reduce that disturbance** (protection or restoration) would be beneficial for caribou, even in the face of more dominant constraints (e.g., predation).
- There is a near **limitless amount of disturbance** that could be restored. Therefore, a **strategic approach** is needed to efficiently deploy the limited restoration resources available to the high priority sites.
- Using a **simple (KISS)** monitoring program will help connect monitoring to project objectives and deploy more resources to actual restoration action.
- **Ecosystem restoration** is basically growing trees towards an old seral stage. Monitoring the tree growth trajectory may be adequate for many projects.
- **Functional restoration** is primarily changing predator behaviour on linear features, as well as human access. Monitoring the condition of the works (e.g., barrier height, berm integrity, vegetation condition) may be adequate for many projects.
- **Monitoring of wildlife** (vs vegetation or works) and application of **remote cameras** may not be required except where a project has deployed treatment at different intensity in the treatment area.
- The prolonged **period needed for trees or lichen** to become established, requires monitoring to occur at several time scales: Short term (1-5 years) to confirm survival and implementation (i.e. does the treatment reflect the prescription); Long term (10-50 years) to confirm establishment and effectiveness.
- While much is known about implementing habitat restoration, there is still the **need for scientific study** and applied research (adaptive management)

Recommendations:

- Develop a simple monitoring system that collects basic information to evaluate if the project objective has been achieved. Monitoring the trajectory of vegetation growth will achieve this goal for many projects.

- Projects are expected to monitor implementation of restoration works and establish a format for longer term monitoring establishment and/or effectiveness

Vegetation Monitoring:

There is a long history of monitoring tree and plant growth in forestry, agriculture and wildlife management. There are existing methodologies that can be adopted for restoration monitoring (MFLNRORD, 2021). Methods will need to be tailored to match the objectives for the project and/or site including if the objective is functional or ecological restoration.

Monitoring ecological restoration can rely heavily on assessing success of planted material.

- For seedings, an **initial survival assessment** at 2 or 3 years post treatment is the first gauge of success. This allows sufficient time for the seedling to exhaust the resources available in the planting plug and illustrate it has tapped into the site. A >70% survival of planting vegetation is a measure of success at this time.
- Assuming the ecological restoration objective is to return the site to the condition and character of the surrounding forest/habitat, the next monitoring period could coincide with **plant or stand establishment**. Depending on site conditions, this could be at 10-15 years post treatment. It may include an assessment of visibility or “line of sight” using a standardized lateral cover tarp. Species composition, survival, height and vigour can be compared with conditions expected from the successional trajectory observed in adjacent habitat.

Achieving >70% survival is a measure of success at this time. However successional trajectories have considerable variability. Caution is required to avoid assessing too narrowly to a preconceived trajectory or path. It may be more appropriate/sound to assess whether the trajectory is headed in the “wrong direction” (e.g grass is dominating, tree height is stunted). **Drone technology** may be useful at this stage of monitoring (see Drone and Unmanned Aerial Vehicles section).

Monitoring Invasive Species:

Monitoring invasive species is a consideration for some site/projects. It is important to be aware if a non-target species begins to take over (e.g. alder). However, alder may contribute to a visual screening objective. Monitoring invasives will increase the cost

and complexity of the monitoring program. While disturbed sites are prone to occupation by pioneering invasive species, caribou restoration sites may be less susceptible.
The risk of occupation by invasive may be reduced by factors such as:

1. Site conditions in caribou habitat can be severe;
2. Planting of desired vegetation is prompt and aggressive, and natural ingress is likely by native species from the surrounding habitat.

The Invasive Plant Council (bcinvasives.ca/take-action/report/) has resources for identifying invasive plant species. The protocols for monitoring vegetation can be modified to capture data on invasive species. Where controlling invasives is an objective, monitoring should be conducted in 2 to 4 years post treatment.

Use of lichen in habitat restoration is an emerging methodology. Its application is restricted somewhat by a limited supply of plantings and the need to avoid damaging the lichen community on a donor site. Lichen are very slow growing. As such a long term and patient monitoring system is required to assess uses for line restoration. The initial assessment is a simple survival survey at year 2 (Resources Information Standards Committee, 2018). Establishment surveys can occur at years 5 and 10 post treatment. Work is underway to determine an appropriate protocol for monitoring lichen establishment and successful restoration. Lichen conditions in adjacent undisturbed sites are likely the best metric to gauge success.

Recommendations:

- Projects are expected to assess the survival stage of project implementation and set expectations for future monitoring of establishment.

Physical Evidence Monitoring:

Functional restoration relies partly on physical manipulation of the site, usually creating a barrier, impediment or disincentive on linear feature. These physical works are often of a short duration (5-15 years) and intended to permit complimentary revegetation to reach establishment stage. Scat, browse, tracks and other evidence of wildlife use have been used as monitoring metrics. These features are labour intensive to monitor and suffer from difficulty in detection and low occurrence. Monitoring the condition of the works may be more efficient and sufficient in some projects. For example, if a barrier maintains its prescribed and installed condition, wildlife and/or human use should be curtailed and not need monitoring perse.

Science suggests that barriers need to be >0.5m high to restrict predator use. Height is a monitoring metric for line of sight and movement assessments. But barrier intactness (i.e. no gaps), roughness (i.e. unable to walk on top of barrier), width (i.e. unable to walk around or leap over) contribute to barrier effectiveness and should be monitored. Furthermore, a barrier must be 1.0 m high to affect human use and 4.5m high to exclude wolf use.

Walking tests have been done using dogs (i.e. a surrogate for predators) or humans (i.e. a proxy for predators). If the treatment is effective, the walking speed on the treated area should be the same or less when compared to adjacent undisturbed forest. The former approach may provide some insight into effectiveness of the treatment (e.g. are wolves likely to be forced off the linear feature). The latter, unless calibrated to a dog or wolf, will only be able to compare consistency of treatments (e.g. implementation).

Recommendations:

- Monitoring for wildlife signs should be limited because it is difficult to use analytically.

- Monitoring evidence of human use (e.g. ATV tracks) may be effective at access control points.

- Monitoring the condition of functional restoration treatment will be sufficient for most functional restoration projects.

Remote Camera Monitoring:

Remote digital camera continue to be a useful tool for monitoring habitat restoration projects. The Wildcam website (wildcam.ca) has a wide range of information and resources. However, remote camera use should be directed by the project objectives which will direct the intensity of use and considerations for camera placement. HCTF produced a guidance report (CHRF_Monitoring_Guidance_Document_2022_23_cycle.pdf (hctf.ca)) that outlines some of the considerations for camera use. There are additional reference material to help inform use of cameras as a monitoring tool (e.g. protocols for BC and Alta) and their application in the field (see references section).

Once the decision has been made to use remote cameras in the monitoring program, measures are needed to **protect the equipment and data from vandalism or theft**. This is particularly important when the restorations works are controversial or face opposition.

Factors to consider include:

- Using cameras with **PIN technology** that locks out use of the camera by unauthorized users.

- Housing the camera in a **sturdy and lockable case**. This can reduce damage to the equipment from bears or humans.
- **Applying labels** to the camera case noting the purpose of the camera (e.g. wildlife research) and deterrent measures in place.
- **Securing the case** to a strong and permeant feature. Attaching cases to medium to large sized trees will usually suffice. Where vandalism or theft is a more chronic problem, consideration can be given to using attachment like Python lock, which is specifically designed to deter theft. However, increasing the security measures for cameras increases the cost of monitoring and measures used should be in step with the risks.
- **T**he camera case and associated gear should have a **matte** (i.e. non-glossy or reflective) **finish** to help camouflage the unit. Metallic items, like pad locks, may reflect headlights and draw attention to the unit.
- Having a **low impact on the area surrounding the camera**. While access to the camera is necessary for installation and monitoring, developing a distinct trail to it should be avoided. Cameras should only need to be visited twice per year if high capacity memory cards and reliable batteries are used. If possible avoid visiting the camera site when snow conditions will make the site more obvious.
- **Branches and other vegetation may need to be cleared** to improve data/image capture in four season and variable weather conditions. However, clearing should not overly expose the camera to people using the area.
- Elevating the camera above DBH can help reduce theft and vandalism and may improve image capture. Climbing devices are available to "climb" up a tree to raise the camera location. However, additional safety procedures will be needed (i.e. fall arrest) to ensure worker safety.

The project will need to have a procedure to protect privacy of images of people that are collected during monitoring.

Data management remains a challenge. There is currently no central hub or data repository consistently used to capture and store digital images and data. Several open access platform exist (e.g. Camelot, Bio-Hub B, Wildtrax) that can be used to store project data. Some can store images while others are restricted to meta-data. BC has developed a supported hub which can act as a central storage location (Resources Information Standards Committee (RISC). 2019. Wildlife Camera Metadata Protocol: Standards for Components of British Columbia's Biodiversity No. 44.) Information of data protocols and uses are available online (see reference section).

Recommendations:

• Take measures to conceal and/or protect equipment.

Drone and Unmanned Aerial Vehicles (UAV):

Use of **aerial devices to conduct monitoring of habitat restoration** is in an early stage of development. These devices can capture high resolution images and data in the visible (still and video) and multi (images) spectrum. They have the potential to compliment or replace ground based monitoring program. The visible spectrum has been used to monitor human use (e.g. detecting new roads and trails), the amount (e.g. detecting tracks in snow cover) and character (e.g. crossing or trailing along a linear feature) of wildlife use. The multi-spectrum has been used to monitor vegetation productivity at immediate, survival, and establishment stages, cover and height to evaluate ecosystem restoration. Success might be determined for ecological restoration when a treated site matches conditions deemed “no treatment needed” during a reconnaissance survey.

Recommendations:

- Examine opportunities to use UAV to replace or compliment ground based monitoring.

Conclusion:

It is important to monitor habitat restoration projects. However, the monitoring program should be focused on the key elements needed to assess project implementation. A clear connection is needed between the project objectives and the monitoring data collected and analyzed. Most projects supported by the CHRF use established techniques to install works or vegetation to mitigate habitat impacts. Monitoring can usually be limited to assessing implementation (e.g. vegetation survival and condition of works). Subsequent monitoring of establishment of vegetation or effectiveness of restoration is usually conducted outside the scope of the restoration project. This approach will help maximize resources available to conduct actual restoration.

To enable subsequent monitoring, and potential aggregation of data from multiple projects, a consistent approach to monitoring is necessary. While there are existing protocols for some aspects of restoration projects (e.g. vegetation survival or condition), work is necessary for other monitoring procedures (e.g. drone imagery, lichen establishment). CHRF will continue to work with practitioners and researchers to develop consistent monitoring methodologies.

Useful References:

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Resources Information Standards Committee May 2018 Inventory and Survey Methods for Rare Plants and Lichens Standards for Components of British Columbia's Biodiversity No. 43 Prepared by Ministry of Environment and Climate Change Strategy Ecosystems Branch Version 1.0

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Tattersall, E.R., Burgar, J.M., Fisher, J.T., Burton, A.C., 2020. Mammal seismic line use varies with restoration: Applying habitat restoration to species at risk conservation in a working landscape. Biological Conservation 241, 108295.

Useful websites:

https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/wcmp_v1.pdf

https://hctf.ca/grants/caribou-habitat-restoration-grants/#resources

https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/inventory_and_survey_methods_for_rare_plants_and_lichens.pdf https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/vri_ground_sampling_procedures_2018.pdf

https://bcinvasives.ca/take-action/report/

https://www2.gov.bc.ca/assets/gov/environment/plants animals and ecosystems/wildlife wildlife habitat/caribou operational_restoration_framework. pdf