Client Meet 1

Questions

What is the purpose/goal of this project? Why are you doing it? What's your inspiration?

> *Enhance habitat and offsetting loss of habitat. He is analysing the effectiveness of the current bat box designs. Keeping temperature data is a bonus. Short term goal for the data is to track the health and effectiveness of the boxes they have now. With data, the long-term goal is that they could improve the boxes they have now and proceed to largescale production. Thus it is important that there are visible results and data that can be easily analysed to determine impact of boxes. Most data regarding bat boxes is from the U.S., therefore they don't have much data to work off of specific to Canada's climate. When reaching the stage for large scale production, green considerations would be ideal, however not at this stage as the cost would go up and the main goal is to collect data.*

What's the scope of the project? (Scalability of manufacturing, etc)

> *In the 100s (Pilot project mostly limited to Southern Ontario). Environmental impacts of the materials and manufacturing processes are not as high of a priority as the actual effectiveness of the tracking. It would only be considered if future large-scale manufacturing were beginning.*

What are the most important features you would like to see for the design? What is your vision for the completed project?

> *Generally installed on tall posts or buildings. 5 to 8 feet off the ground. Device must be: low cost, track and store results, be attached to the bat box, be easy to install/remove by non-engineer. 1 visit per month for maintenance max. Monthly maintenance should not be disassembling and replacing panels: avoid disrupting the bats. They will always be placed in an area with direct sunlight for the majority of the day. Controlled temperatures and ease of access are important design considerations.*

Are there any current inspirations for a design or previous designs that have been considered? If so, what are they?

Be careful of the difference between current Canadian designs and current US designs. Paint has an impact on temperature inside the box and there are optimal paints for different geographic regions. Current count designs include manual counting in some cases, and measurement of waste quantity. Manual counting is very expensive to scale. Currently ¾ inches between slats, this spacing is shown to be preferred by bats and discourages other species.

They are constantly installing new bat boxes, however existing ones won't be taken down if they haven't reached the end of their lifecycle (sensors should also be able to be installed on existing boxes). If an improved design comes along they are more than likely to install it.

What type of environment are you planning on using the product in? Does it need some kind of camouflage? Will it be left out in the winter? What are the extremes of weather to withstand?

April until October, it will not be left out in the winter, however it would be ideal to make it reusable for every year. It should be able to withstand temperatures above at least 0°C

How precise does the counter need to be?

> *Total visits or occupancy? Total visits are suitable for them to extrapolate the population data and effectiveness. Ideally, they would like to look at data over a long period of time, but there would be a bonus but not required to record time of entry or exit in addition to the counter data points. Real time data would be a requirement in their long term goal. There is no need to differentiate between entries and exits, however what the sensor is tracking should be clearly indicated and consistent. By knowing what is being tracked the data can be adjusted as desired by the analyst.*
>
> *Note: Dataset with better confidence is preferred, rather than sensors/data collection with higher variability*

***If we don't need to build the box:** What material should the box be? What are the dimensions/is there a diagram for the bat box? Should it have some kind of hook so it can be easily attached to a tree?

> *Yes, we do need to build both the box and the device. In an actual design it should be made of thick plywood. The prototype can be of another material. How a bat box works: outer size of 6 feet across by 8 feet tall and carries multiple compartments 1 to 2 in thick. Small enough for predators to stay out but big enough for the bats. They land on the notched bads in the landing area. Exit via the same opening. In the US they are completely open at the bottom because its warmer. In Canada it is better insulated by not keeping all slats open from the bottom. In the tip of southern Ontario there are sometimes vents. These slats are almost always removable to clean out wasps, etc. 6 inches of space from the bottom up to where they would start to roost. If it only works for a range of bat box sizes, that is okay, but we need to indicate what those constraints of assumptions are.*
>
> *Other design considerations*
>
> - *Darkness is needed (if plexiglass viewport is used, there must be a cover)*
> - *Around a foot of landing space*
> - *Material: bats need to be able to latch onto it, notched/rough materials are best*
> - *The box, including the sensor, should be designed such that they don't disturb bats (minimize movement of box)*
> - *Temperature is moderated by different paint colours, however new ways can be looked at*
> - *Boxes are designed the same for different species, want to have dimensions that can accommodate any species so that only one bat box needs to go into production*
> - *Bats need to be able to swoop in and drop out without any obstacles*

What is the amount of time/lifetime you expect the box to be functional? Environmental lifecycle? How often do you expect updates?

Used in spring, summer, and fall. Must operate between April and October. Must require minimal maintenance (1 visit per month maximum). Updates can be made live, but it is not required. Most active at twilight and at dawn.

What kind of bat are you planning on tracking? Will other creatures attempt to enter the box, and do we need to distinguish them from bats.

Two species of bat are federally endangered in Canada. 3 species are known to use bat boxes: little brown bats, big brown bats, and in the western provinces: Yuma bats. The device does not need to be used to identify the species. One species will use a given box. There will not be overlap of species in the same box at the same time. Therefore, there is no need to distinguish between species, this can also be done through eyewitness and identifying the guano. Assume that only one bat crawls in at a time, relatively orderly, but again: they are bats.

What functions are you hoping to achieve with the bat house? What needs of the bats are you hoping to satisfy with the house?

Warm, dry, safe summer roost site. Temperature and access are important. Higher than 40 degrees is an issue. It would be a bonus to measure temperature inside the box.

In what geographical areas should it be functional? (For connectivity and for weather)

Ontario and the rest of northeastern north america. Pilot project will be limited to Southern Ontario. This is because they are usually installed as an offsetting measure for urban development.

Schedule for contacting? When can expect a response? Preferred method of communication?

What is your measure for success? Appearance? Functionality? Environmental life cycle? Number of bats?

What will be looked at is the functionality of both the bat boxes and the sensor as they work together (sensor must have a way to attach onto box). With regards to requirements, the bats must be able to use to box and the user must be able to get data.

Additional Notes

- Client is a mechanical engineer, does a lot of analysis (employee at tiree), analyse effectiveness of bat boxes to build better boxes in the future
- Goals: healthy environment goals, healthy economy, protect the planet
    - Biodiversity: preserving ecosystems, keep living world healthy
    - Climate solutions: mitigate and adapt to climate change
    - Integrate ecosystems in how we develop infrastructure (green ways)
- Bats provide pest control, essential component of healthy ecosystem

    - Habitat loss and degradation to ecosystems due to infrastructure development, pollution and climate change
- Bonus features
    - Live access to data
    - Timestamps for data points
    - Gathering temperature inside the box

- Bat box locations: Experimental farm

- Common predators: larger birds, predatory bugs (ex: wasps), snakes

- Bat population depends on size of the box (50-100 for smaller boxes, up to a thousand for big boxes)

- Anything directly below would be in range for excrements

- Product must
    - Fulfill research goals
    - Be affordable and reproducible
- Tracker must be actual product, however the bat box can just be a prototype (without the real dimensions) that has the purpose of demonstrating how the sensor will attach on
- Must display drawings and dimensions, potentially have a CAD model, determine how material will be obtained, how connections are going to be done