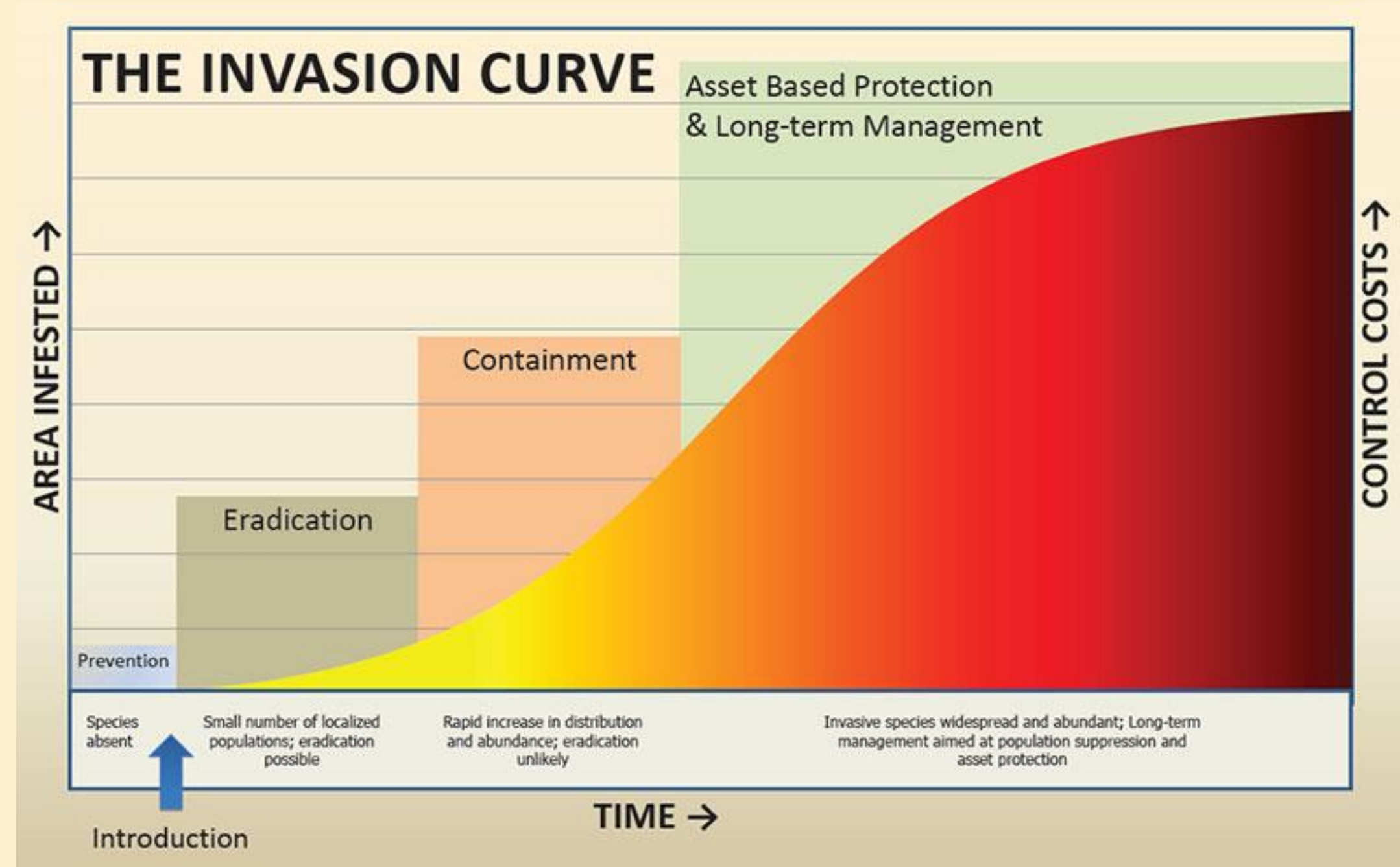


BACKGROUND AND RELEVANCE

- An ecological survey provides a snapshot outline view of what a particular area was at the time of surveying.
- It helps to estimate the vegetation and species in the area.
- During the development, such surveys help minimize the damage to the biodiversity, while also helping to maintain the flora and fauna population.

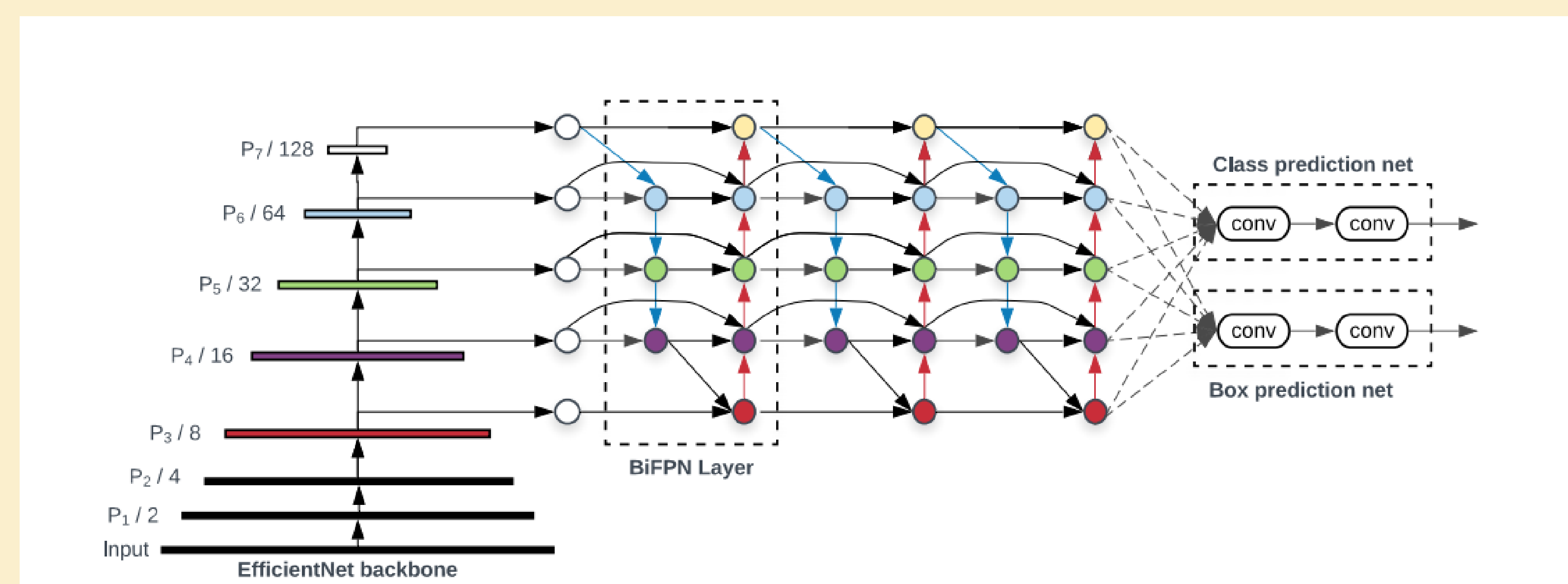
Early identification of any ecological constraints ensures that development proposals are not delayed, and appropriate mitigation or compensation is incorporated into the design phase. Such surveys are time-consuming and labor-intensive because they require one to travel and document the entire area by foot or using a vehicle. Also, these surveys are way costlier and require much time and technical skills and are difficult to perform in topologically-challenging areas. These manual surveys are prone to human errors, and these surveys are needed to be precise to avoid any damage to biodiversity. Sighting probability is another factor that also limits the traditional aerial surveys for animals, as it tends to be less than 75%. Also, the images we get have limitations in resolution. We propose the use of drones and RC cars to monitor areas.



Invasion Curve^[1] – Used to understand the behavior of invasive species

METHODOLOGY

- We plan to use Deep Learning models based on the architectures of EfficientDet^[2] and CenterNet^[3]. These state of the art models have had an excellent performance and are highly capable of segmenting and detecting images. On top of that, these architectures are perfect for real-time usage hence perfect for our task.
- Models will be trained using pytorch and once trained not only will it help more people access the model but help improve the performance with more data being available.
- We will need drones and RC vehicles for this project which need to be quiet as animals usually run away with a loud noise. For the drone, we would use DJI Inspire 2^[4], which is one of the best drones available on the market. It provides a good range, low noise and stabilized videos. Its 4K camera should help in capturing detailed images and videos of biodiversity in the area.
- In another work, the creators are using AI to detect invasive species along the roadside with a camera mounted on the top, which indeed is a right way but would not tell us in-depth about species inside the forest.
- There are various approaches to use a drone to map habitat, but none of those use it for a more detailed survey as of now, also using an RC with a drone in the same region can help create better results^[5].



EfficientDet Architecture^[2]

GOALS AND OBJECTIVES

Advances in computer vision have made object detection much faster and accurate. Current applications are limited to images to recognize animal species.

- Using drones and RC cars, we would use state of the art model to identify plant and animal species in real-time.
- The data collected can also be used to enhance the performance of the models further. Not only does this method save time over existing processes but also reduces fuel spent by travelling hence more eco-friendly.
- Drones also give the ability to reach dense areas of the forest with considerably lower risk and the ability to take close-up images is another upside.

Our proposed method will improve survey quality while reducing all costs and labor involved, along with improved precision and detailed analysis needed for generating extensive reports. These surveys are part of any development activity that is taken up by private organizations or government agencies, and hence it can help them make better plans and have a discussion around it.

RESULT

- Since the habitat can positively impact how the biodiversity is in a particular region, surveying the area can help the concerned authorities to get the data about the habitat and take necessary actions whenever needed. Our project will help to increase not only the effectiveness of the survey but also lower time and labor to a great extent.
- Many traditional techniques for ecological surveys of wildlife and their habitats have many challenges like the high costs, considerable time, large personnel, and high-level technical skills involved, as well as inaccessibility to topographically-challenging habitats.
- We will deploy our models on GitHub for open-source use. Not only will it help more people access the model but help improve the performance with more data being available,
- We will monitor its performance and effectiveness by comparing simultaneous observations by our techniques and conventional techniques. If our models produce better outputs than the conventional ones with taking into account the cost complexity, then we can propose and use these models worldwide.

REFERENCES

- [1] <https://eco-intelligent.com/2016/10/19/identify-invasive-species/>
- [2] https://openaccess.thecvf.com/content_CVPR_2020/papers/Tan_EfficientDet_Scalable_and_Efficient_Object_Detection_CVPR_2020_paper.pdf
- [3] <https://arxiv.org/pdf/1904.07850v2.pdf>
- [4] <https://www.dji.com/inspire-2>
- [5] <https://insideecology.com/2017/08/01/use-of-unmanned-aerial-vehicles-for-ecology/>