

# Nesting site studies of White-bellied Sea Eagle (*Haliaeetus leucogaster* Gmelin, 1788) along Konkan Coast, Dist. Ratnagiri, M. S., India

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## ABSTRACT

Nesting behaviour of White-bellied Sea Eagle has been meagerly studied though; the raptor is widely distributed along the coast of Maharashtra. Present study was carried out by conducting surveys for locating their nesting sites along coast of Ratnagiri district and 12 nests of White-bellied Sea Eagle *Haliaeetus leucogaster* at different sites along Velas to Dabhol were studied. Various ecological parameters such as nesting tree species, nesting tree height, nesting tree GBH, nest height, geo-coordinates, distance from coast, disturbance level were considered. WBSE was found to be most abundantly nesting (N =12) on *Casuarina equisetifolia* tree which, accounts to 83% of the total nesting trees and only 02 nests, just 17% of the total nesting trees studied, were on *Sterculia foetida*. In most cases, it was observed that WBSEs prefer nest trees with larger GBH as compared to same tree species of smaller girth. Location of nest from the supratidal mark was measured to study nesting preference about distance from the sea and we found that, the nearest nest was 30 m away from the coast and the farthest one was at a distance of around 900 m. A positive correlation (Pearson's Correlation test,  $r = 0.865$ ,  $P < 0.05$ ) between the nest height and the nest tree indicates the characteristic nest building of WBSE on the top most canopy of the nesting tree. Highest and lowest nest height recorded was 34 m and 18 m from ground, respectively. At each study site, the level of threat was noted with respect to anthropogenic disturbances and those caused by other species. The land ownership of the nesting sites was noted as it would be a crucial parameter for preparing conservation guidelines.

**Key words :** Nest site characteristics, Ecological parameters, Land ownership, Anthropogenic disturbances, Conservation guidelines.

## Introduction

Coastal region of Maharashtra, popularly known as Konkan coast is characterized by beautiful serene beaches, coconut (*Cocos nucifera*) and Whistling Pine (*Casuarina equisetifolia*) plantations and dense forests. It comprises of 5 major districts and Ratnagiri

among them being located towards southwest part of Maharashtra. The district is bordered by portion of biodiversity hotspot Western Ghats to the east, i.e., Sahyadri hills and open Arabian Sea on its west. Being coastal region, variation in temperature is insignificant, ranging between 22 °C to 30 °C. It is highly humid and experiences heavy rainfall during

rainy season resulting into copious vegetation that includes large trees, shrubs, and herbs sheltering variety of animals.

White-bellied Sea Eagle (WBSE) (*Haliaeetus leucogaster*) is observed to be distributed along both the coasts, i.e., west and east coast of India. It is large sized, diurnal, monotypic bird of prey confined to aquatic bodies like inshore sea, islands, estuaries, and wetlands (Quinn, 1969). Global distribution stretches from India, Sri Lanka, SE Asia, Philippines to Australia and Tasmania (del Hoyo *et al.*, 1994; Mayr and Cottrell, 1979). Though, it is a resident avian species, it has been meagerly studied from research point of view.

Morphologically it can be described as, large sized raptor having wing span of around 180-220 cm, wedge shaped tail measuring around 75-85 cm in length and adult with exclusively with grey and white plumage. Males can be distinguished from females as they are slightly smaller in size. These birds are usually in pairs and prefer tall tree tops for nesting. Huge sized nest serves for feeding, breeding and resting.



Fig. 1. An adult White-bellied Sea Eagle



Fig. 2. Juvenile White-bellied Sea Eagle

## Materials and Methods

Sea shores of villages in Ratnagiri district from Velas (in North) to Dabhol (in South) were extensively scanned for identifying the nest locations of WBSE.

### Following are the nesting sites

**Nest locations:** 1) Velas 17°57.629'N; 73°1.683'E, 2) Velas - 17°57.655'N; 73°1.87'E, 3) Kelshi 17°54.85'N; 73°3.327'E, 4) Kelshi 17°54.64'N; 73°3.715'E, 5) Aade 17°53.263'N; 73°4.408'E, 6) Anjarle 17°50.825'N; 73°5.46'E, 7) Anjarle 17°51.216'N; 73°5.157'E, 8) Murud 17°46.855'N; 73°6.945'E, 9) Murud 17°47.078'N; 73°6.823'E, 10) Karde 17°45.09'N; 73°7.418'E, 11) Ladghar 17°43.216'N; 73°8.053'E, 12) Kolthare 17°39.049'N; 73°8.054'E. Field studies were conducted (from November 2016 to April 2017) using modern instruments like binoculars (Celestron 8 x 40), GPS (Garmin Etrex -10) for defining the coordinates, cameras (Nikon Cool Pix P 600 Nikon D 5300 SLR coupled with AF-S NIKKOR 55-300mm lens and a tripod), Laser Range Finder (Spypoint 1500 PRO) and measuring tape for measuring Girth at breast height of the trees. WBSE nests were identified by conducting reconnaissance survey, multiple visits at different sites and opportunistic finding by following the bird. The nesting occupancy was identified by observing activities like adult carrying food, bird calls and other movement of WBSE within one km radius from the nesting tree (Azman *et al.* 2013). Some nests were found on private lands and were observed by seeking help from local people.

The visual surveys were carried out for recording parameters like:

(1) Height of the nesting tree, (2) Height of the nest from the ground, (3) Nesting tree species, (4) GBH of nesting tree, (5) Distance from sea and (6) Status of occupancy of each nest. Some nests were found on private lands and were observed by seeking help from locals. Nesting locations spread in entire study area of almost 80 km coastline were covered on two-wheeler.

## Results and Discussion

During survey, 8 villages of Ratnagiri district namely Velas, Kelshi, Aade, Anjarle, Murud, Karde, Ladghar, Kolthare were identified with 12 nests of WBSE. They were seen performing various activi-

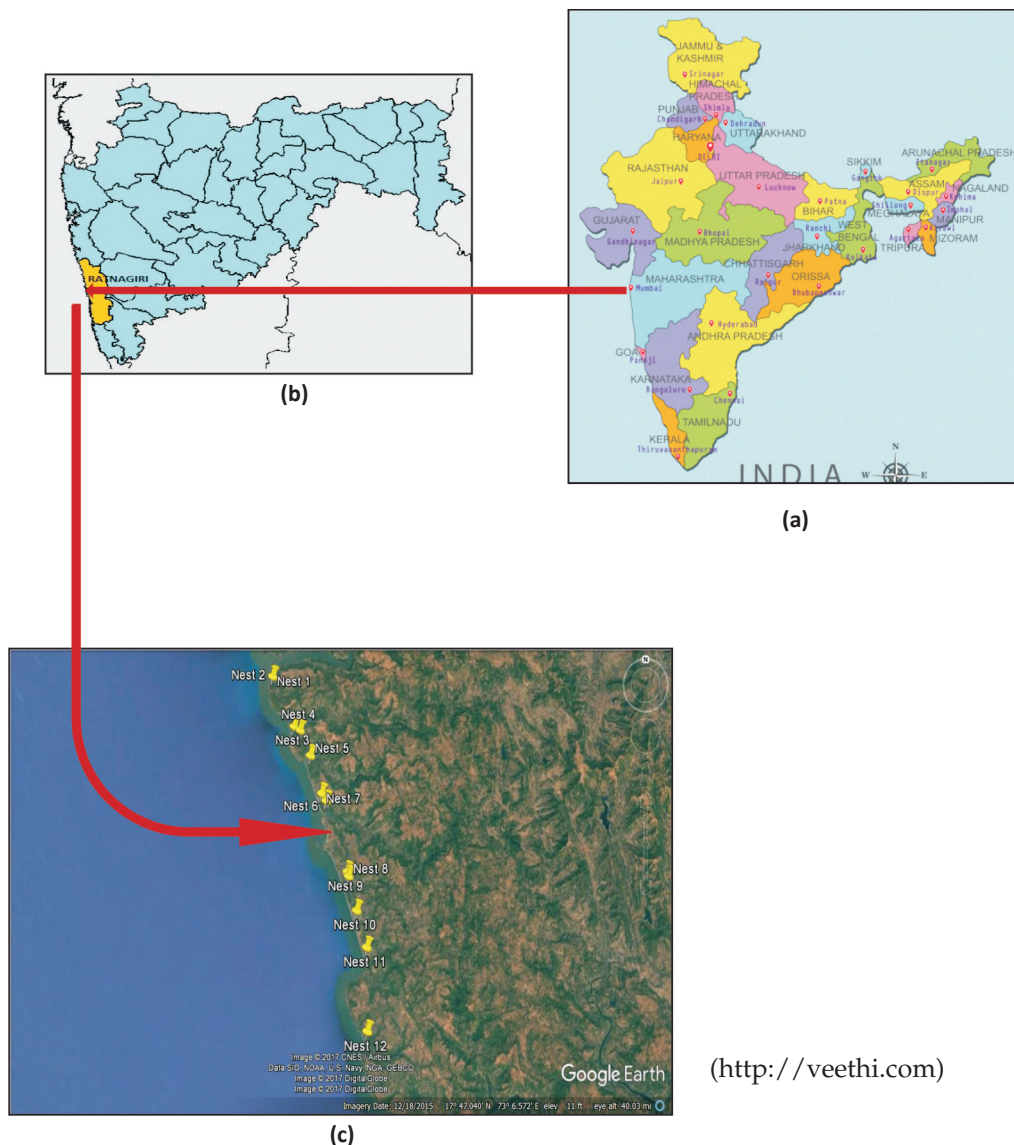


Fig. 3. Study Area- a) Map of India b) Ratnagiri District map c) Nest-sites

ties like roosting, feeding, nest repairing, soaring, and courtship display. Courtship display such as diving, gliding, flying parallelly, mating and duetting, i.e. continuous calls given by male and female simultaneously after mating were heard. At many occasions the raptor was seen getting into territorial fights with intruders, like House crow and other predatory birds mainly Black kite and Brahminy kite. House crows were seen stealing food items and nesting materials from WBSE's nest and were usually seen mobbing the juvenile when adult wasn't around. It was frequently seen bringing mango (*Mangifera indica*) leaves to a nest site where juvenile was present. WBSE were observed capturing prey

items like sea snake, fishes and wader birds. In one isolated incidence, an adult was observed feeding a sea snake to its young ones. Juvenile was seen indulging in various activities like wing flapping, nibbling small barks of the nesting tree, playing around with the adult.

The presence of nests of other raptors in nearby areas were recorded which could pose threat to the productivity of WBSE nest. Anthropogenic disturbances such as logging, lopping and recreational activities were also considered. Different levels of disturbances were categorized as low, moderate and high depending upon the qualitative data collected.



- (a) Low: Rare human activity, low recreational use and no nest of other raptors within 200 m radius.
- (b) Moderate: Moderate recreational use, moderate human activities in the vicinity and no nest of other raptors within 200 m radius.
- (c) High: High human activities and high recreational use and/or nests of other raptors or



Fig. 4. House crows stealing nesting



Fig. 5. An adult carrying nesting material material from the WBSE's nest



Fig. 6. Fight with Black kite



Fig. 7. Mating pair

crows within 200 m radius.

Table 1 shows different parameters of nesting recorded during studies and nesting tree species as well. It can be seen that, out of 12 nests 10 nests are on *Casuarina equisetifolia* while remaining two on *Sterculia foetida*.

### Nesting Preference

WBSE was observed to be mainly nesting on *Casua-*

Table 1. Nest Characteristics at different sites

| Place    | Nest tree                      | Height (m) |      | GBH (cm) | Distance from sea (m) | Distance from other water body (m) |
|----------|--------------------------------|------------|------|----------|-----------------------|------------------------------------|
|          |                                | Tree       | Nest |          |                       |                                    |
| Velas    | <i>Casuarina equisetifolia</i> | 33         | 26   | 183      | 200                   | 45                                 |
| Velas    | <i>Casuarina equisetifolia</i> | 35         | 31   | 137.2    | 220                   | 30                                 |
| Kelshi   | <i>Casuarina equisetifolia</i> | 32         | 25   | 223      | 141                   | NA                                 |
| Kelshi   | <i>Casuarina equisetifolia</i> | 27         | 25   | 244      | 900                   | NA                                 |
| Aade     | <i>Casuarina equisetifolia</i> | 31         | 29   | 264.16   | 142                   | 500-550                            |
| Anjarle  | <i>Sterculia foetida</i>       | 27         | 26   | 188      | 260                   | 350                                |
| Anjarle  | <i>Casuarina equisetifolia</i> | 35         | 27   | 289.56   | 46                    | NA                                 |
| Murud    | <i>Sterculia foetida</i>       | 19         | 18   | 237.74   | 340                   | 150                                |
| Murud    | <i>Casuarina equisetifolia</i> | 27         | 25   | 508      | 349                   | 8                                  |
| Karde    | <i>Casuarina equisetifolia</i> | 26         | 24   | 279.4    | 30                    | 120                                |
| Ladghar  | <i>Casuarina equisetifolia</i> | 28         | 27   | 269      | 40                    | 400—420                            |
| Kolthare | <i>Casuarina equisetifolia</i> | 37         | 34   | 374.9    | 100                   | 700-1000                           |

*rina equisetifolia* (N =10) tree that forms 83% of the total nesting trees (i.e. N=12) and only 2 nests (that is 17%) are on *Sterculia foetida*. But the result does not imply that the species actively selects *Casuarina* sp., because most beaches are covered with *Casuarina* plantation. So, the preference for *Casuarina* tree might be ascribed to the abundance of *Casuarina* plants at most of the near beach areas. In addition, it has been observed that WBSE builds its nest high on tree. *Casuarina* being the only taller species available on these beaches, can also be one of the reasons for preference otherwise WBSE is reported selecting other tall trees such as *Mangifera indica* in Maharashtra (Katdare and Mone 2003; Katdare *et al.*, 2004) and *Ficus* sp. in Netrani island (Pande *et al.*, 2011).

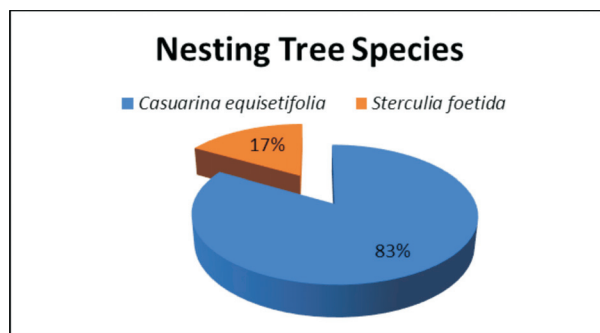


Fig. 8. Nesting tree species of White-bellied Sea Eagle

### Correlation-regression analysis

The correlation between the height of the nest and height of the nesting tree shows positive association (Pearson's Correlation test,  $r = 0.865$ ,  $P < 0.05$ ) between them, which indicates the characteristic nest building on the top most canopy of the nesting tree.

### Nesting tree GBH preference

Nesting tree GBH was assessed for checking whether

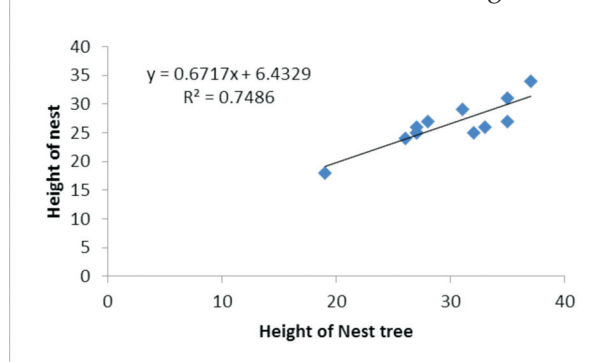


Fig. 9. Nest Height Vs nesting tree height

the nest-building is related to the tree girth. As most of the nests were found on the *Casuarina* tree plantations it could be concluded that WBSE prefers nest trees with larger GBH as compared to the trees with smaller GBH (approximately less than 100 cm) in the surrounding area.

It can be seen from the Figure 10, that majority of the nests were placed in the GBH range of 250-300 cm followed by the ranges 200-250 and 150-200, while single nests were observed in the ranges 100-150, 350-400 and 450-500.

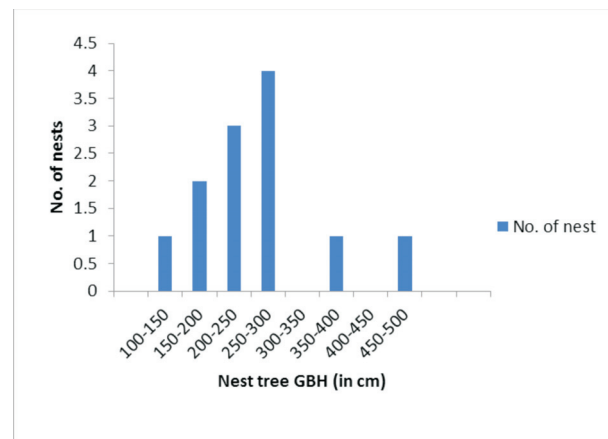


Fig. 10. No. of Nests Vs Nest Tree GBH

### Preferred distance from the sea

Distance between nesting site and the sea was measured to know how far WBSE preferably nests away from sea. 3 nests were seen in ranges of 0-100, 100-200 and 200-300 meters away from sea and 2 nests in range 300-400 meters and a single nest was seen in range 900-1000 meters which was the farthest single nest that was recorded. No nest was seen from meters 400 to 900. It can be understood that, proximity to sea can serve advantageous as sea is the main hunting ground for the bird.

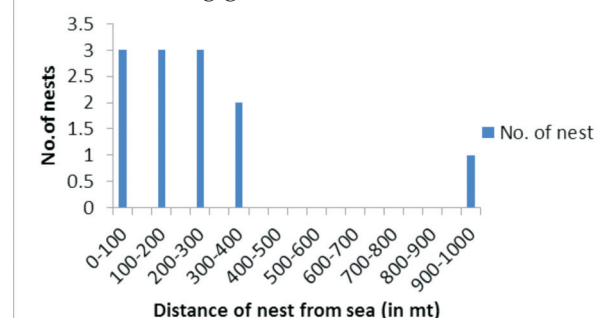


Fig. 11. No. of nests Vs Nest distance from sea

### Conservational importance

During field survey, extent of threats and disturbance at each of the nest site was studied and the same is shown in Table 2. The analysis reveals that, habitat of WBSE majorly included *Casuarina* plantations. Most of the other nests were on private land ('wadi') owned by locals, where coconut and areca nut are cultivated along with ketki (*Pandanus sp.*) plantations which form the hedges. Study sites were assigned high, moderate and low threat levels.

The nests were frequently monitored to confirm their constant occupancy. Thus, 11 out of 12 nests were found to be occupied, while one was found to be inactive. From the information given by locals, it was noted that 1 inactive nest was active in the previous breeding season at Velas and a second nest was built by the same pair for the current breeding season. According to a survey done by Sahyadri Nisarg Mitra - a Chiplun based environmental NGO - during 1996-1998, three nesting sites (total 6 nests) were observed, wherein the respective breeding pairs were using two nests (both in good condition) in alternate years.

The locations of the nesting habitat of WBSE were recorded and the ownership of land where the nesting tree is located is shown in Figure 12. The trees with nest were found either in Private Land or in the land belonging to Forest Department. This is a crucial parameter as it directly poses threat to the

occupied nest and its inhabitants, viz., adults, juveniles, eggs. During the present study, 75% nests were found in private land and only 25% of them were found in the government regulated land (Figure 12). The protection of nesting trees on private land is at the sole discretion of land owner. Such lands provide a limited access and hence, there are restrictions on the movement of people in these lands. This obviously limits the disturbances to nesting activities of WBSE. Also, the nesting trees lying in jurisdiction of forest department are subject to revenue generation since *Casuarinas* are planted so that can be logged after certain years for timber pur-

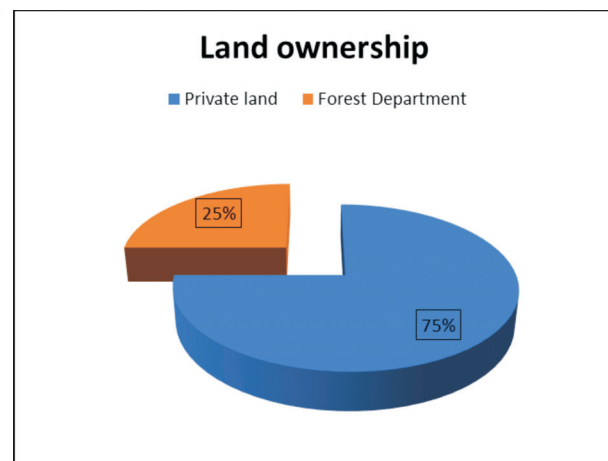


Fig. 12. Land ownership of the 12 Nest sites of White-bellied Sea Eagle

Table 2. Nest-details

| Sr. No. | Place    | Habitat   | Land ownership | Disturbance level | Occupied |
|---------|----------|---|----------------|-------------------|----------|
| 1.      | Velas    | Plantations of <i>Casuarina equestifolia</i> , <i>Calotropis sp.</i>  | Forest dept.   | High              | -        |
| 2.      | Velas    | Plantations of <i>Casuarina equestifolia</i> , <i>Calotropis sp.</i>  | Forest dept.   | High              | +        |
| 3.      | Kelshi   | Plantations of <i>Casuarina equestifolia</i> , <i>Areca catechu</i> and <i>Cocos nucifera</i>                         | Private        | Moderate          | +        |
| 4.      | Kelshi   | Plantations of <i>Mangifera indica</i> , <i>Tectona grandis</i>   | Private        | Low               | +        |
| 5.      | Aade     | Plantations of <i>Pandanus sp.</i> , <i>Casuarina equestifolia</i>  | Private        | High              | +        |
| 6.      | Anjarle  | Plantations of <i>Casuarina equestifolia</i> , <i>Areca catechu</i> and <i>Cocos nucifera</i>                         | Private        | moderate          | +        |
| 7.      | Anjarle  | Plantations of <i>Cocos nucifera</i> and <i>Musa sp.</i>  | Private        | Low               | +        |
| 8.      | Murud    | Plantations of <i>Mangifera indica</i> , <i>Areca catechu</i> , <i>Musa sp.</i> and <i>Cocos nucifera</i>             | Private        | Moderate          | +        |
| 9.      | Murud    | Plantations of <i>Cocos nucifera</i>  | Private        | Low               | +        |
| 10.     | Karde    | Plantations of <i>Casuarina equestifolia</i> , <i>Cocos nucifera</i> , and <i>Ipomea sp.</i>                          | Forest dept.   | High              | +        |
| 11.     | Ladghar  | plantations of <i>Cocos nucifera</i>  | Private        | Moderate          | +        |
| 12.     | Kolthare | Plantations of <i>Cocos nucifera</i> , <i>Calotropis sp.</i> , <i>Castor</i> , <i>Pandanus sp.</i> , <i>Ficus sp.</i> | Private        | Low               | +        |

[- = not occupied, + = occupied]

poses. This is one of the prime concerns as it was seen that these trees remain unprotected which, may subsequently destroy their micro-habitat and force WBSEs to relocate elsewhere. These nesting trees are prone to destruction due to activities such as lopping, logging and tree cutting. These activities could have large scale implications on the nesting by WBSE. The adults may eventually, abandon their eggs or young ones, which further could be destroyed or preyed upon and this in turn may greatly affect the nest productivity.

## Conclusion

Though mentioned as least concern (with declining population) in IUCN red list (<https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22695097A93489471.en>), it is known to be vulnerable because of human interference and habitat loss. It was observed that these eagles select nesting near the human dominated landscapes. They were predominantly seen nesting on the tree commonly used for timber collection. The most ironical point is that, *Casuarina* plantation has been conducted in large areas by locals for obtaining timber. The trees in private land are logged for raising money and also sometimes for firewood and it has already been mentioned that majority of WBSE nests were on these trees. The existence of WBSE in the study area is being threatened by loss of habitat due to developmental activities, disturbance to nesting pairs by various human activities like clearing of the revenue lands, building private beach resorts that attract tourists and consequent tourism activities along the shore. This might force the birds to abandon their nests and relocate to sub-optimal habitats where their breeding success can get affected (Bell, 1983; Bilney and Emison 1983; Clunie, 1994; Dennis and Lashmar, 1996; Mayr and Cottrell, 1979). Considering the anthropogenic interferences, a sudden decline in population of WBSE in the near future could be expected. Thus, monitoring the population in this region is essential, conservation of population of this bird by creating awareness amongst the locals is mandatory for the management of the species.

This study is a preliminary assessment of the nesting sites of WBSE in the northern Ratnagiri district of Maharashtra. Monitoring future changes will be possible as this survey should serve as groundwork for the collection of baseline data that will add

to the better conservation and management of WBSE in these regions.

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