

OVERVIEW

1. Windsor Research Centre (WRC)
- A Brief History
2. Cockpit Country Conservation Planning
3. **Homerus Conservation**
- An Epic of Landscape Proportions
- 4 Hot-Off-The-Press News
- 2016 and Onwards ...

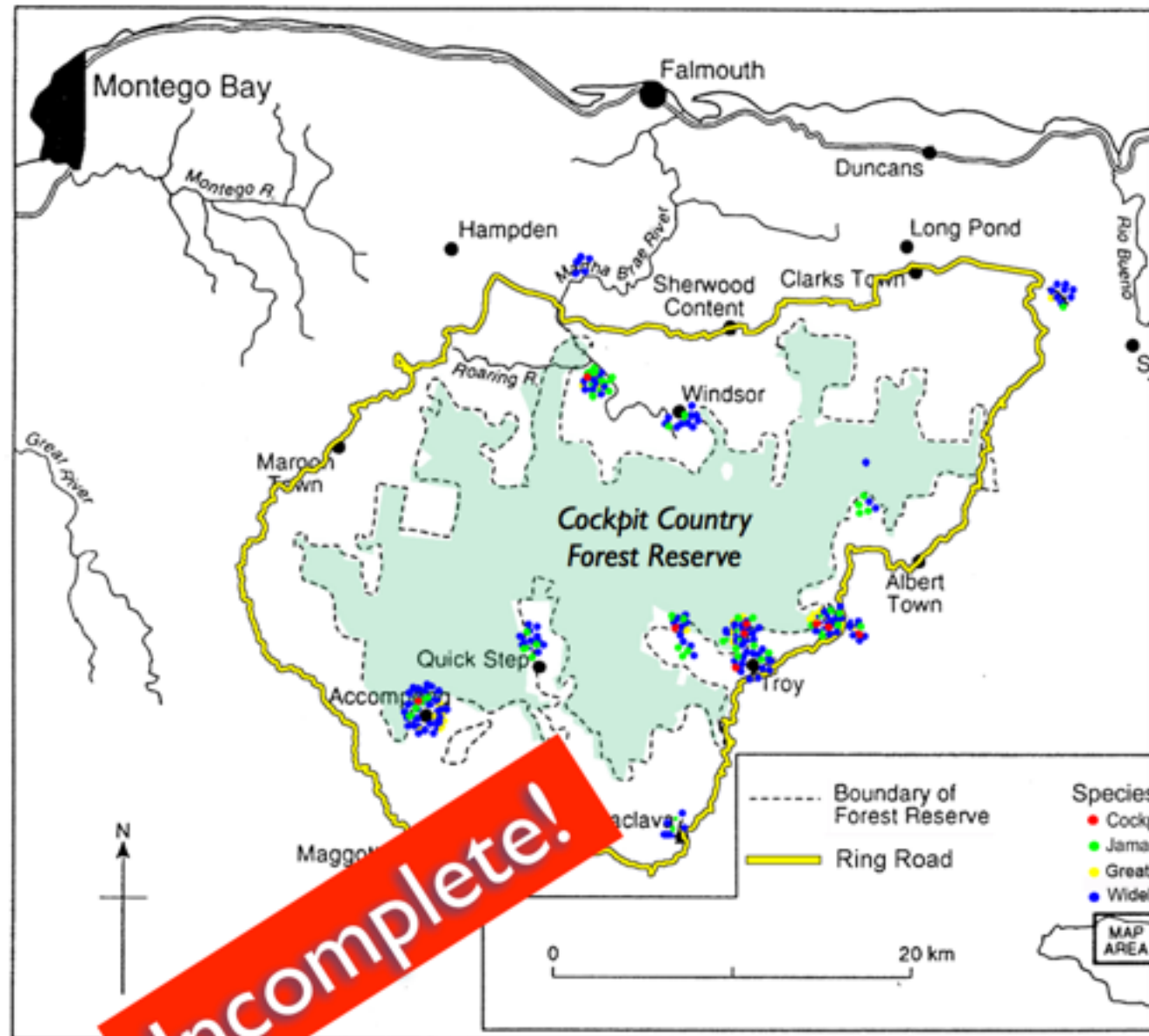
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3. *Homerus*: An Epic of Landscape Proportions

Where actually
is Cockpit
Country ?



JAMAICA AND ITS BUTTERFLIES

F. MARTIN BROWN
Research Associate, Department of Entomology
The American Museum of Natural History

&
BERNARD HEINEMAN

ILLUSTRATED BY
MARJORIE STATHAM FAVREAU



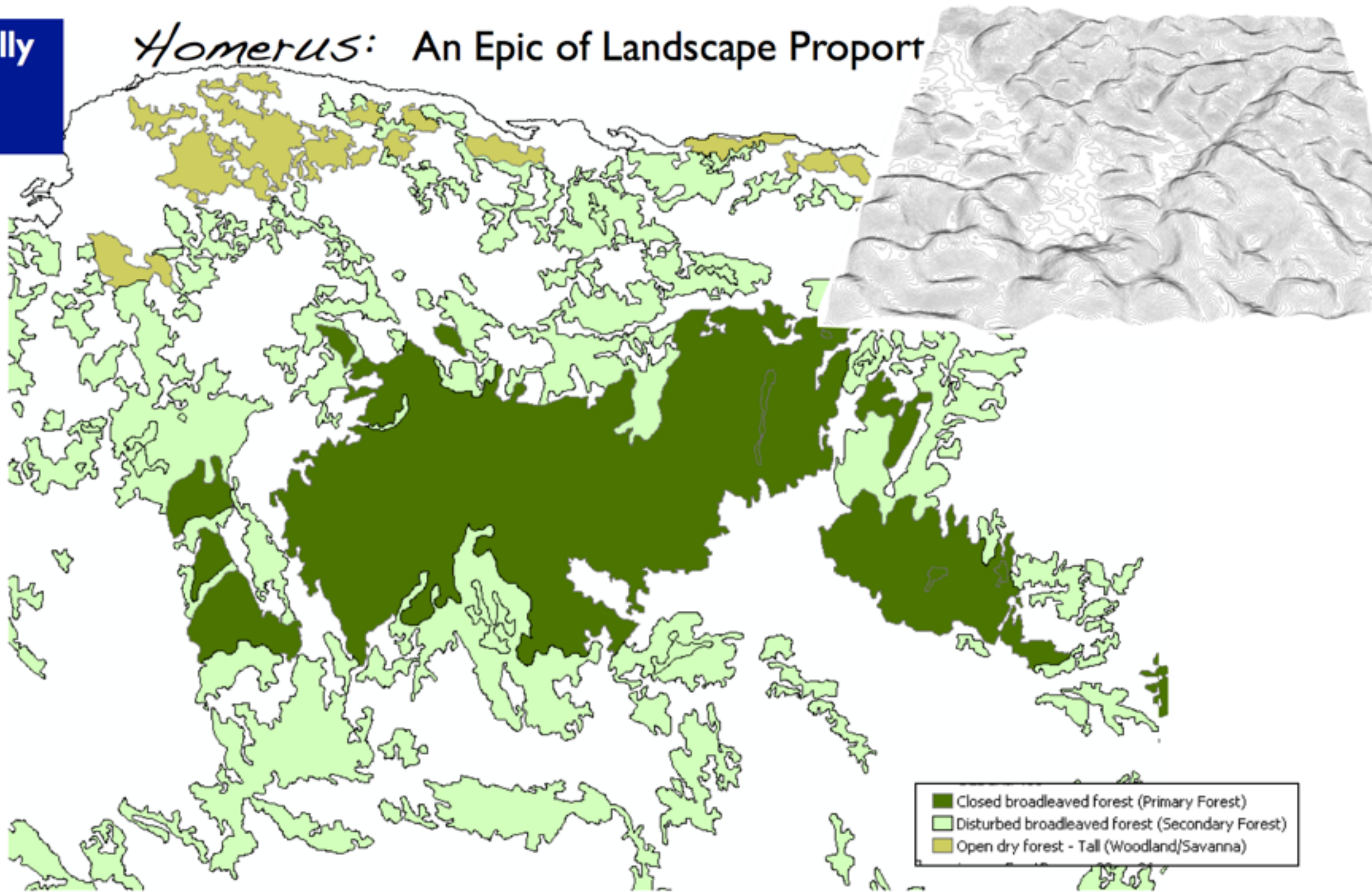
E. W. CLASSEY LIMITED, LONDON, 1972

From Susan's World Bank/GEF Report (2000):
Figure 3.10. Reported butterfly localities in the ~~Cockpit Country~~.

In the previous section (2. *Conservation Planning*), I described how for a World Bank-GEF project in 2000 I had **hand-mapped** the distributions of endemic plants and animals in “Cockpit Country”. Data primarily were from a desk-based literature review and the focus was on the Cockpit Country Forest Reserve — this latter point left me blinkered from seeing the Big Picture.

Where actually
is Cockpit
Country ?

Homerus: An Epic of Landscape Proport



As mapping and Geographical Information System (GIS) software improved, so to did our ability to visualize the full landscape of Cockpit Country. It was easier to “see” the morphology, which shaped whether humans found it easy to clear land for settlement vs. leaving forest cover on rugged, inaccessible areas.

Homerus: An Epic of Landscape Proportions

Where actually
is Cockpit
Country?



Google earth



HOMERUS: An Epic of Landscape Proportions

Where actually
is Cockpit
Country?



Google earth



We were able to map the cultural heritage of the Maroons and the British. Recall, it was the British who named the area "Cockpit Country".

Homerus: An Epic of Landscape Proportions

Where actually
is Cockpit
Country?



Google earth



We could accurately map the rivers which emerge from the cockpit karst aquifer.

HOMERUS: An Epic of Landscape Proportions

Where actually
is Cockpit
Country?



Google earth



We could more-reliably map the distributions of plants and animals, including what was regularly called the “Cockpit Country population of the Homerus Swallowtail”.

It transpired that my old “Ring Road” excluded the western range of this species: not only is it a good thing Homerus didn’t read my report but it’s good that we were finally able to understand the story which Homerus had to tell us!

Homerus: An Epic of Landscape Proportions

Where actually
is Cockpit
Country ?



Google earth



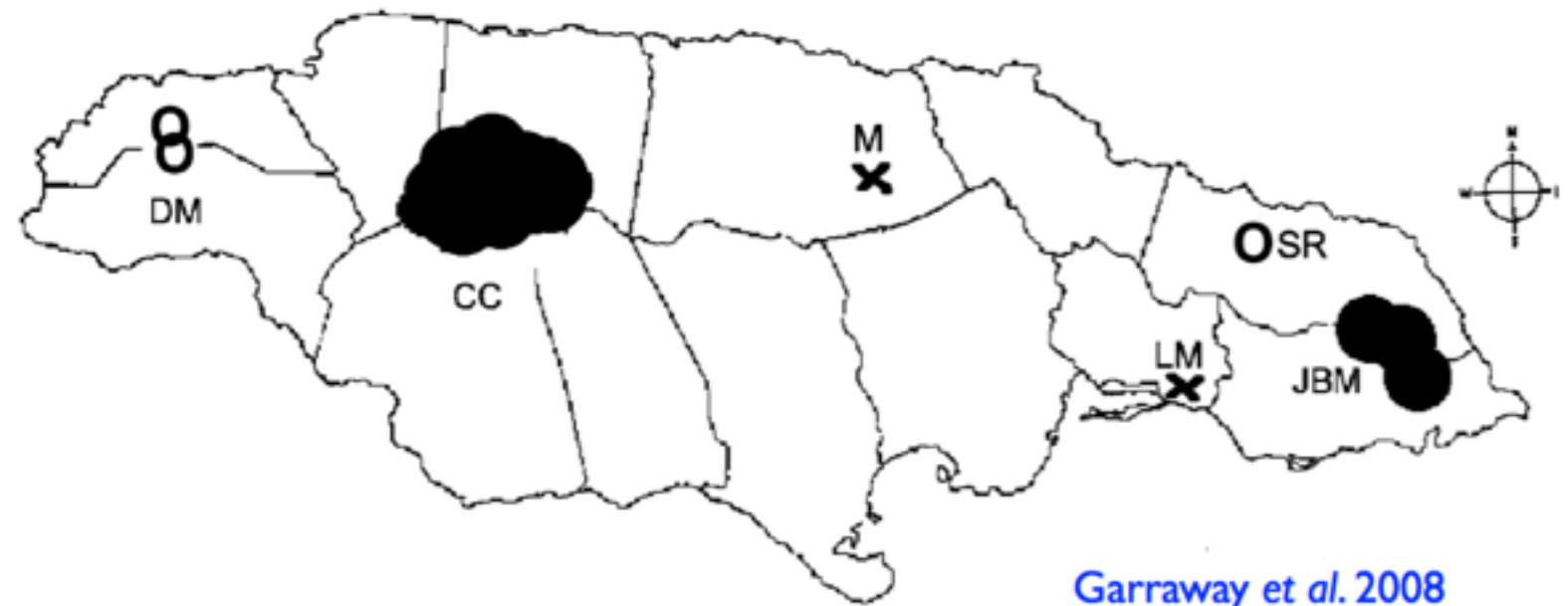
With all of these GIS layers - culture, geomorphology, hydrology, and biology - we were able to correctly define the boundary of Cockpit Country and ensure that we were identifying the habitat occupied by *Homerus*.

Homerus: An Epic of Landscape Proportions



2004 - 08

Fig. 1 Map of Jamaica showing study areas. DM, Dolphin Head Mountain; CC, Cockpit Country; M, Mt Diablo; SR, Spanish River; LM, Long Mountain; JBM, John Crow and Blue Mountains; ●, Breeding populations; ○, larval food plant only; ✕, adult sighting only from previous studies



Garraway et al. 2008



William Jones
1783-1785

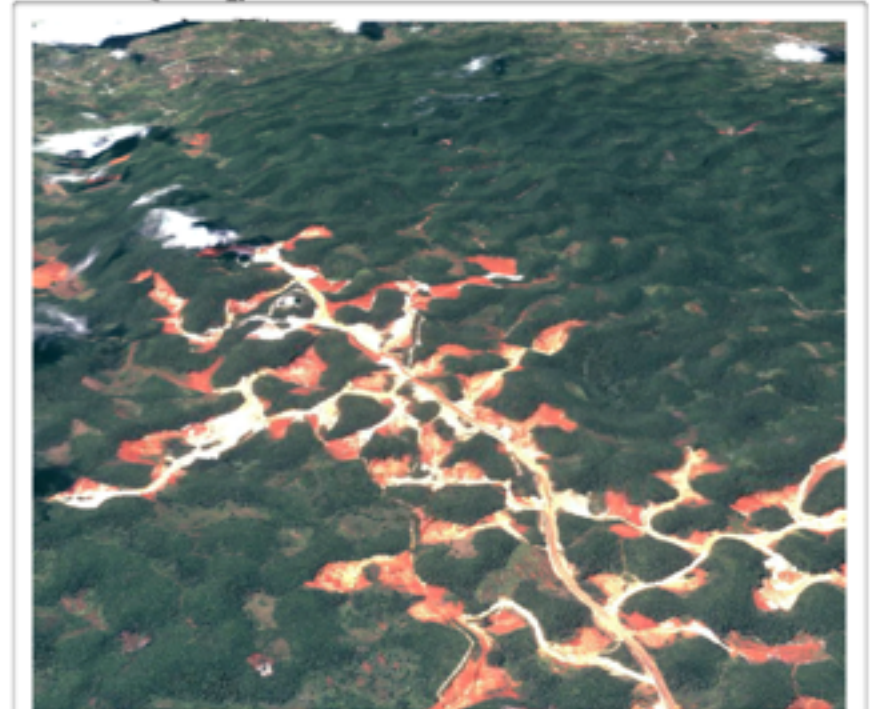
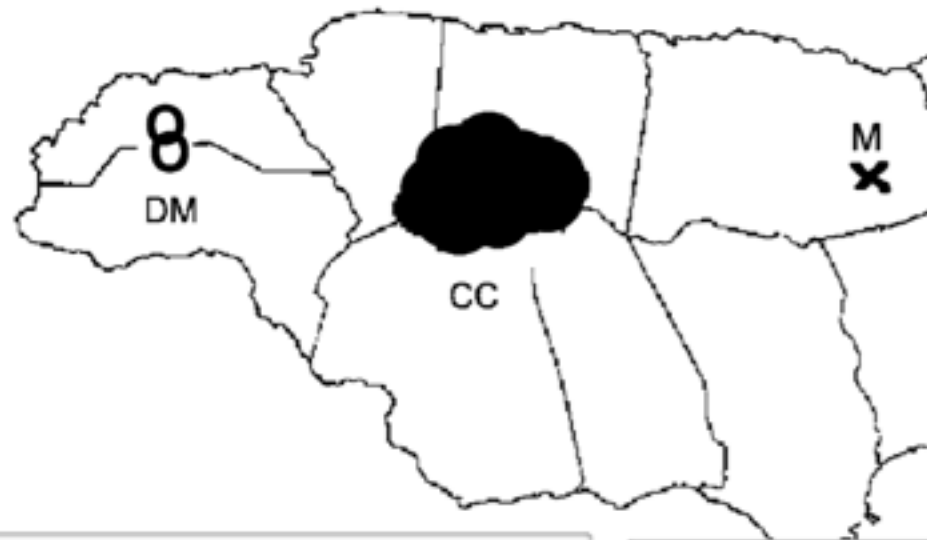
As we began consolidating the GIS layers for Cockpit Country, we received our first grant for Homerus Conservation in 2004 from Zoos Help in the Netherlands. We were able to leverage this with another project we were working on in Mt. Diablo (“M” on the above map), which was part of the historic range of Homerus, in central-east Jamaica.

HOMERUS: An Epic of Landscape Proportions



2004 - 08

Fig. 1 Map of Jamaica showing study areas. DM, Dolphin Head Mountain; CC, Cockpit Country; M, Mt Diablo; SR, Spanish River; LM, Long Mountain; JBM, John Crow and Blue Mountains; ●, Breeding populations; ○, larval food plant only; ✕, adult sighting only from previous studies



Mt. Diablo and its wider environs have been subjected to open-pit bauxite mining for more than 5 decades. Mining severely fragments a forested landscape, both with the extraction of ore bodies from bottomlands and the extensive network of haulage roads which are excavated or dynamited through hillsides. This fragmentation leads to desiccation along the newly-created edges of forests and can be detected for at least 60 m. We quantified this drying effect using microclimate data loggers and by looking at the changes in diversity of epiphytes (orchids and bromeliads): bio-indicators which are very sensitive to sunlight and humidity regimes.

Although the larval host plant was present, we detected no evidence of *Homerus* in Mt. Diablo: We believe Mt. Diablo no longer offers the microclimate that this butterfly needs to survive.

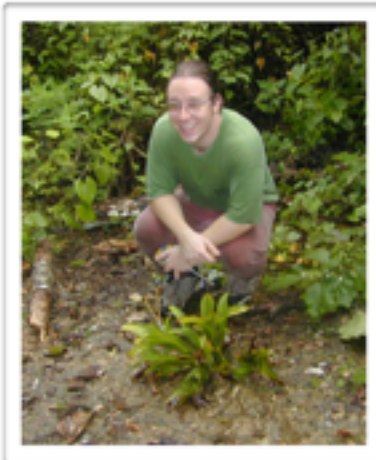
Homerus: An Epic of Landscape Proportions



2004 - 08

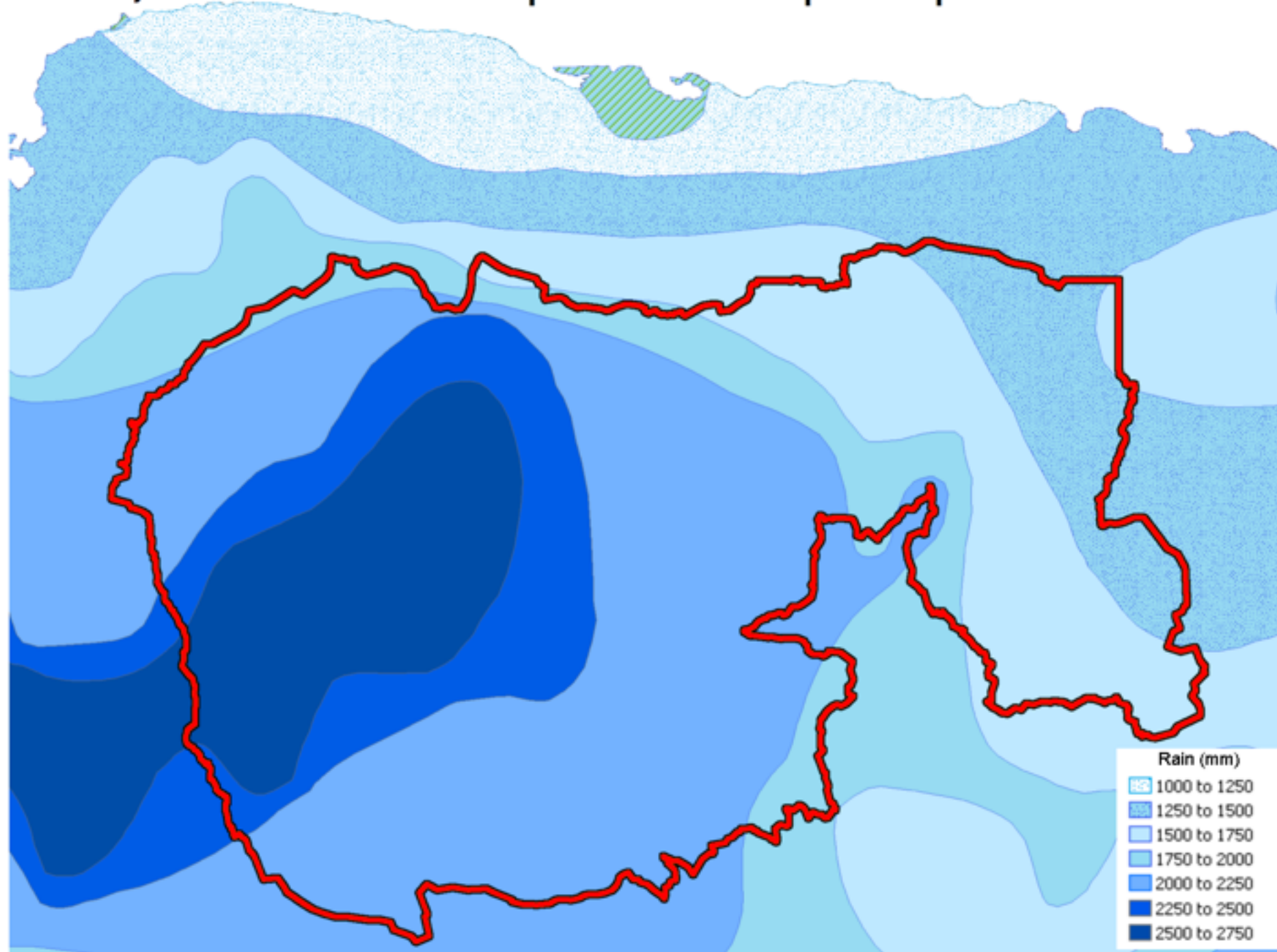


Phil Gonsiska



During our Mt. Diablo epiphyte surveys, we also had the opportunity to survey for epiphytes in eastern Cockpit Country. We noted the regular occurrence of Homerus' larval food plant *Hernandia jamaicensis* and recorded the presence of the Jamaican Blackbird (*Nesopsar nigerrimus*). This endemic bird prefers the same microclimate of high rainfall & high humidity as Homerus and, indeed, co-occurs with Homerus in the Blue Mtns and in western Cockpit Country. We found no signs of Homerus in eastern Cockpit Country and were slightly puzzled because the habitat looked to be fairly comparable to the forest of western Cockpit Country.

Homerus: An Epic of Landscape Proportions



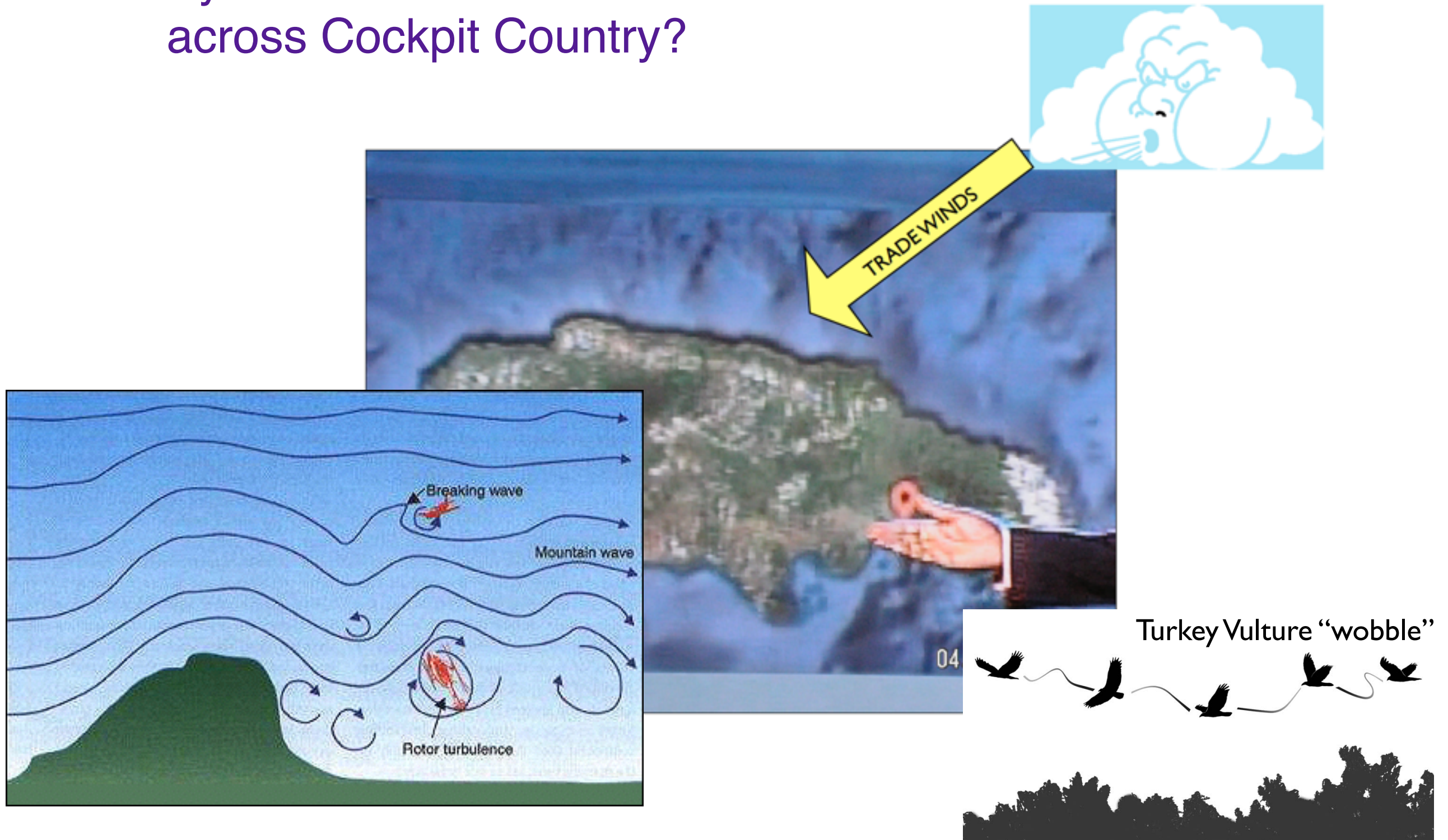
However, when we added rainfall isoclines to our Cockpit Country - Homerus GIS, we could see immediately that the climatic conditions of eastern Cockpit Country might not be favorable to the survival of Homerus - a species which requires 100% relative humidity for all stages of its life cycle, from the hatching of eggs through successful unfurling of wings during eclosion.

Why isn't the rainfall uniform across Cockpit Country?



- Moisture-saturated air from the Caribbean Sea is blown inland by trade winds.
- When the air reaches the elevated interior plateau, the air rises and cools; through this orographic effect, water vapor (clouds) form and in the image above define the north and east boundaries of Cockpit Country.

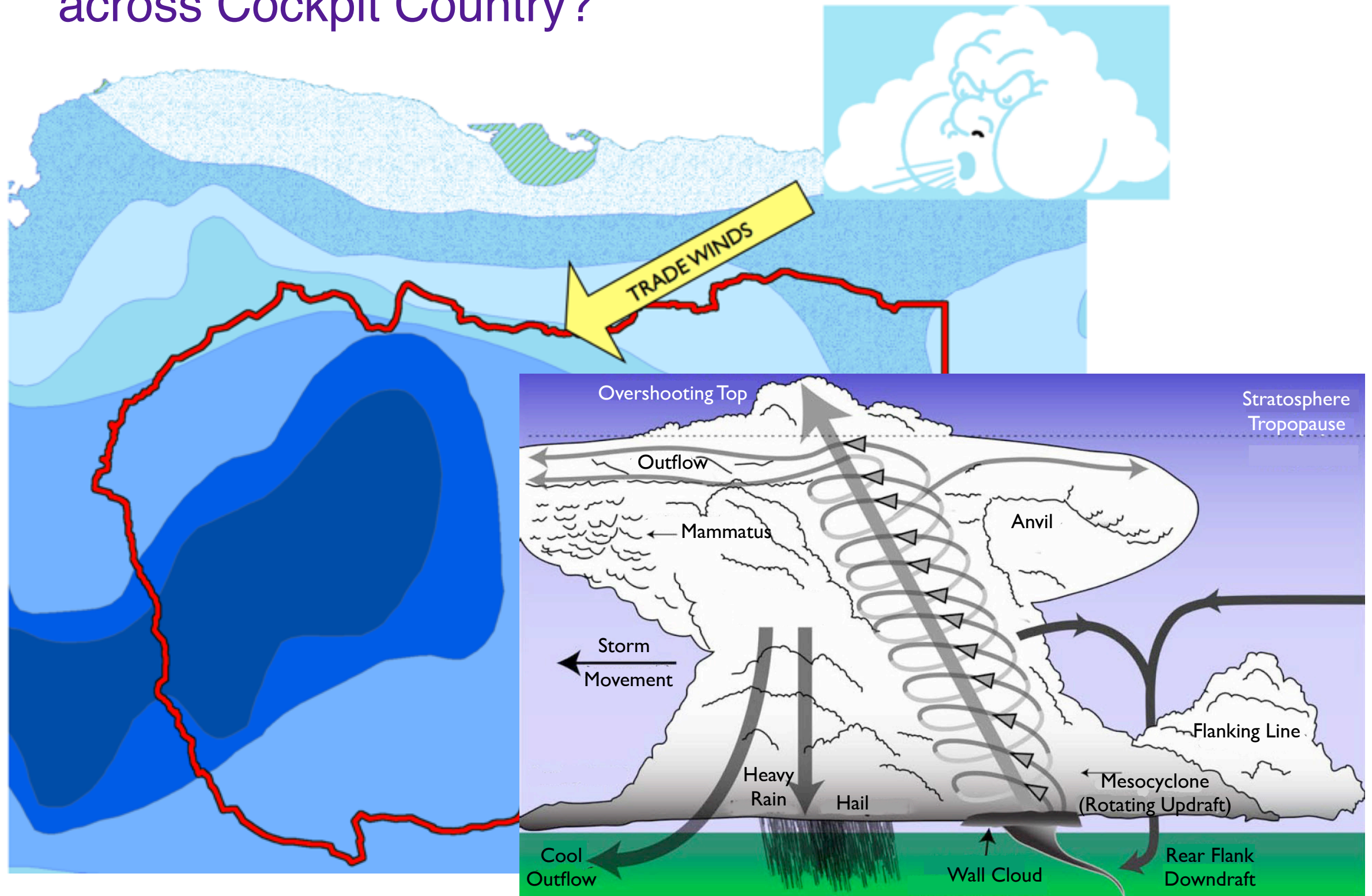
Why isn't the rainfall uniform across Cockpit Country?



Mallon et al. 2016

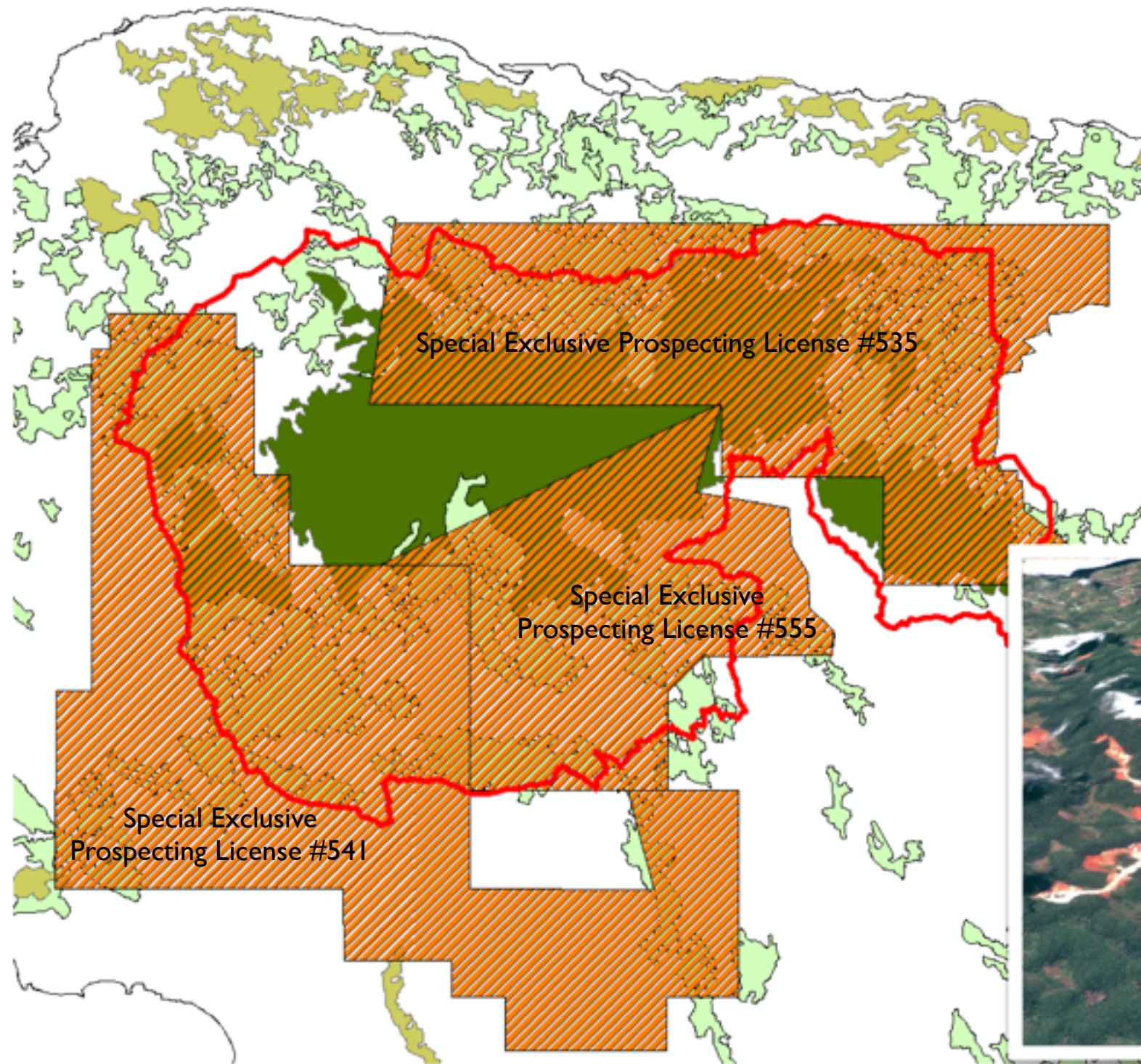
- Water molecules are hydrophobic: they don't coalesce into rain unless forced into it. But the unevenness of cockpit karst and the uneven heights of the evapo-transpiring trees create instability in the airflow.

Why isn't the rainfall uniform across Cockpit Country?

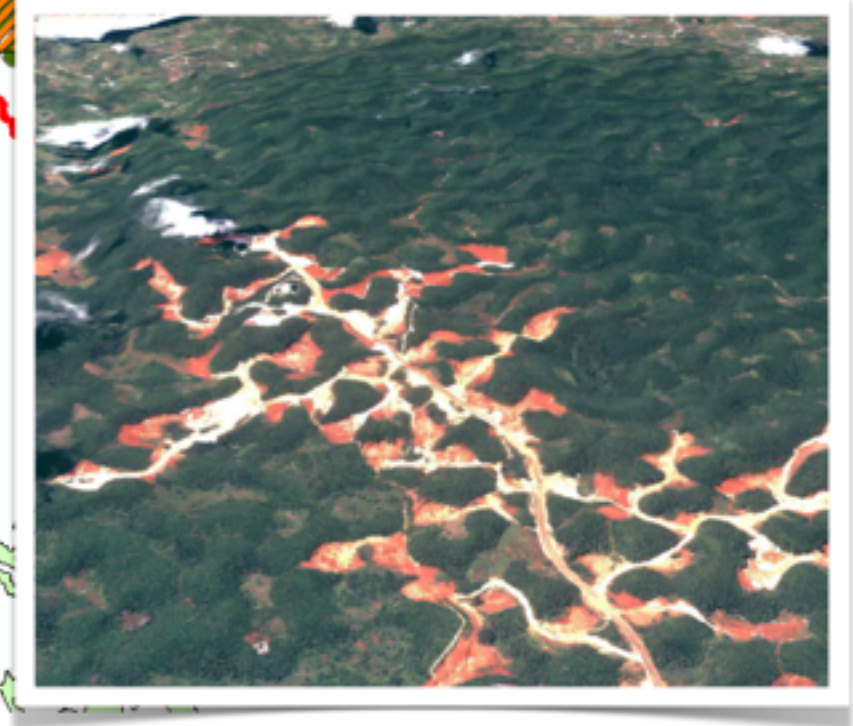


- Air instability leads to the formation of thunder clouds
- It takes time for the thunderstorm mechanism to operate, and the “Anvil” overshoots in the downwind direction. Thus, the major precipitation is biased downwind (e.g., as seen in the SW pattern in Cockpit Country).

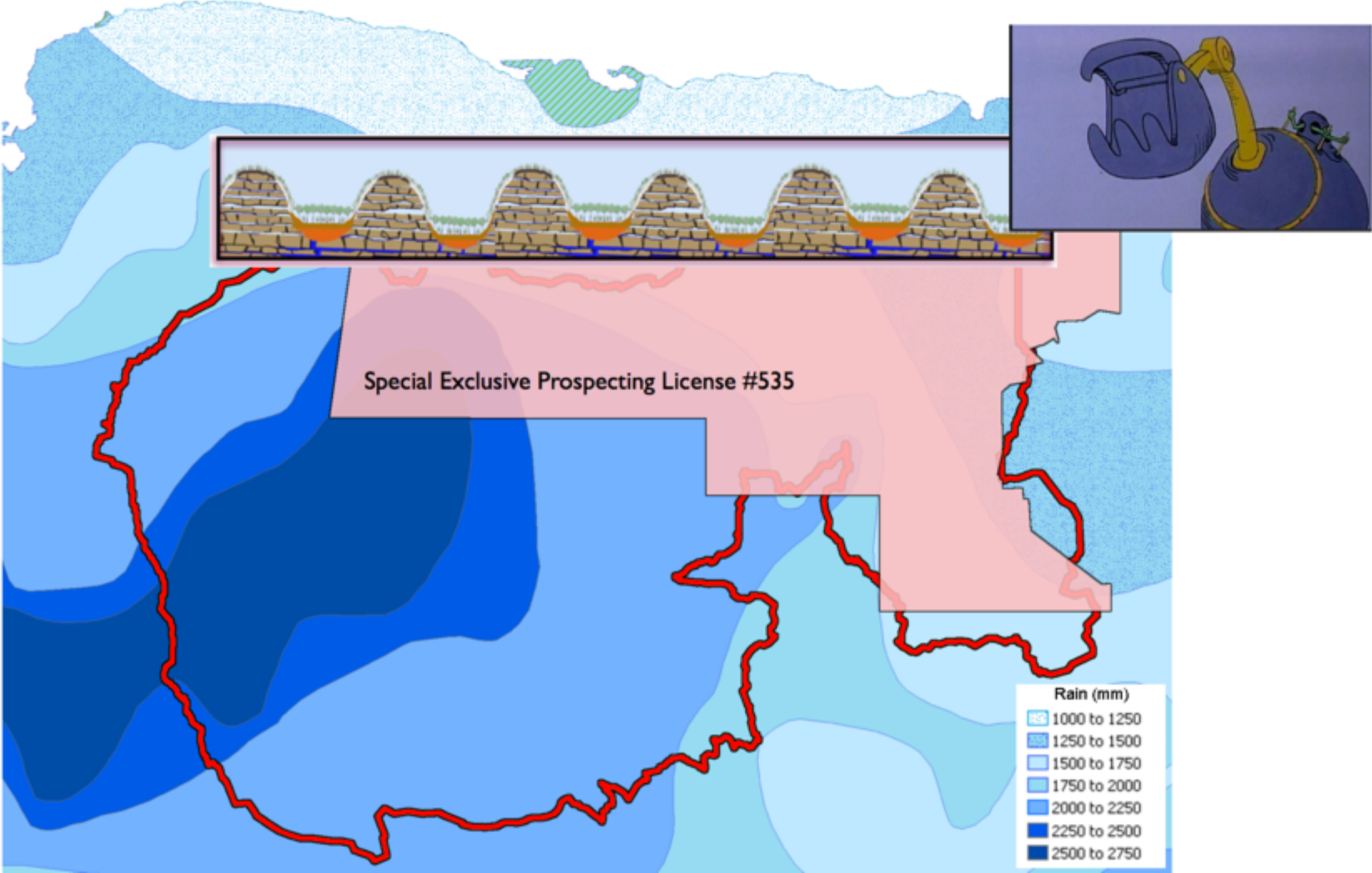
How will bauxite mining affect Homerus' Cockpit Country?



- Habitat loss
- Fragmentation
- Micro-site drying

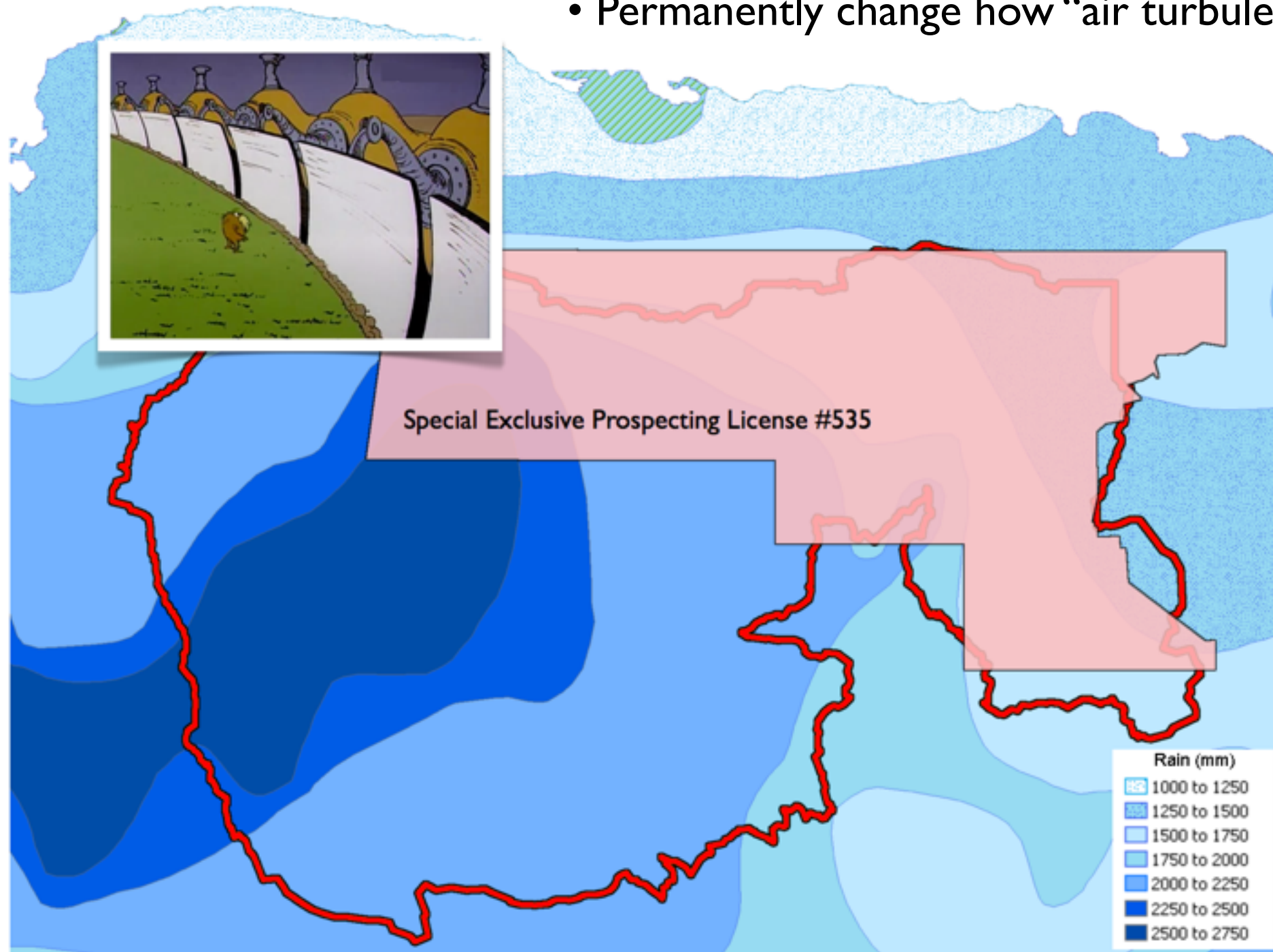


How will bauxite mining affect the climate of Cockpit Country?

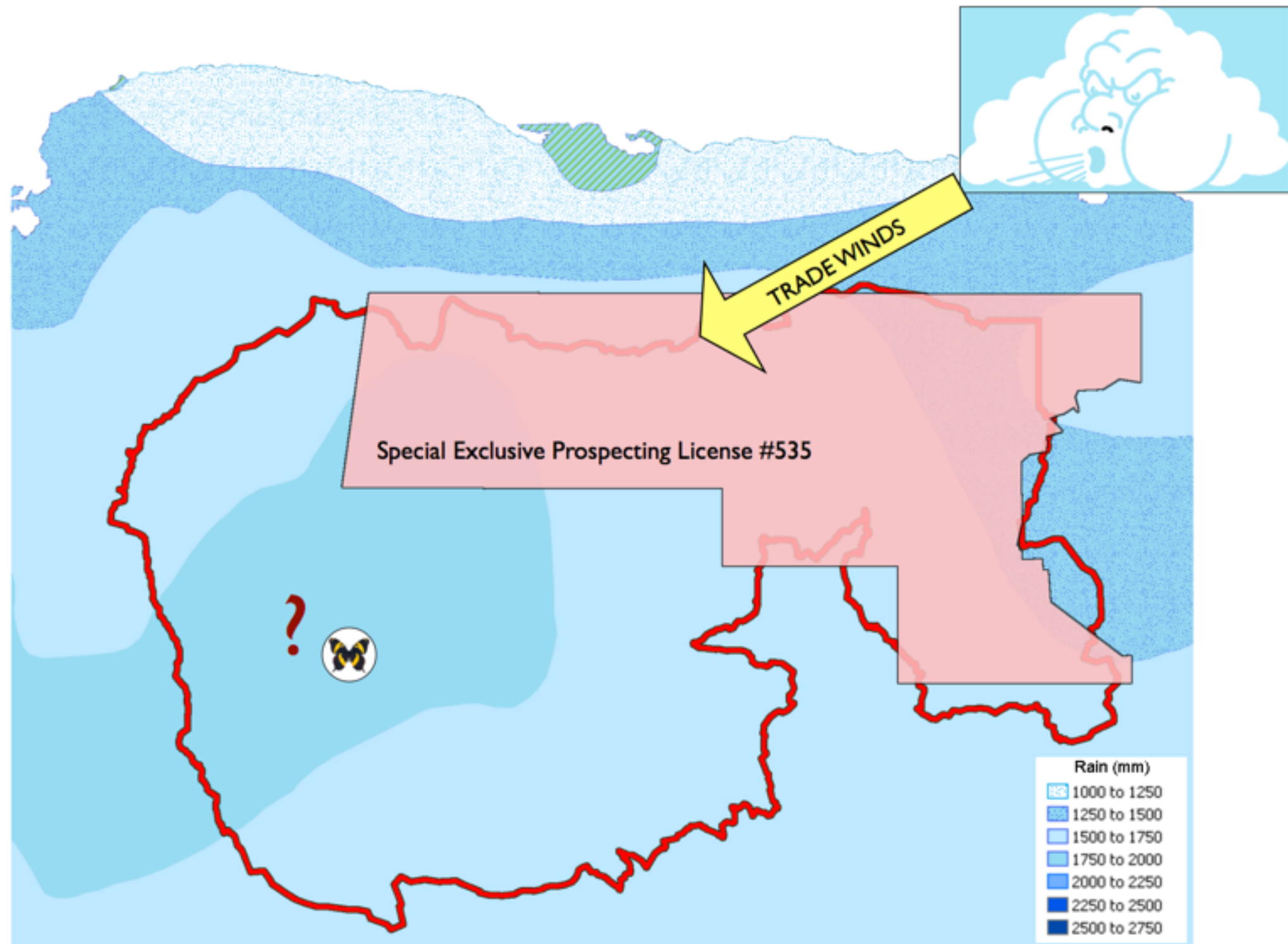


How will bauxite mining affect the climate of Cockpit Country?

- Irreversibly alter the land form
- Permanently change how “air turbulence” is created



Will bauxite mining irreversibly change rainfall in Cockpit Country?



Can Homerus survive in a drier Cockpit Country?

NO!

Homerus & Friends: An Epic of Landscape Proportions

CRITICAL ECOSYSTEM
PARTNERSHIP FUND
2013 - 15

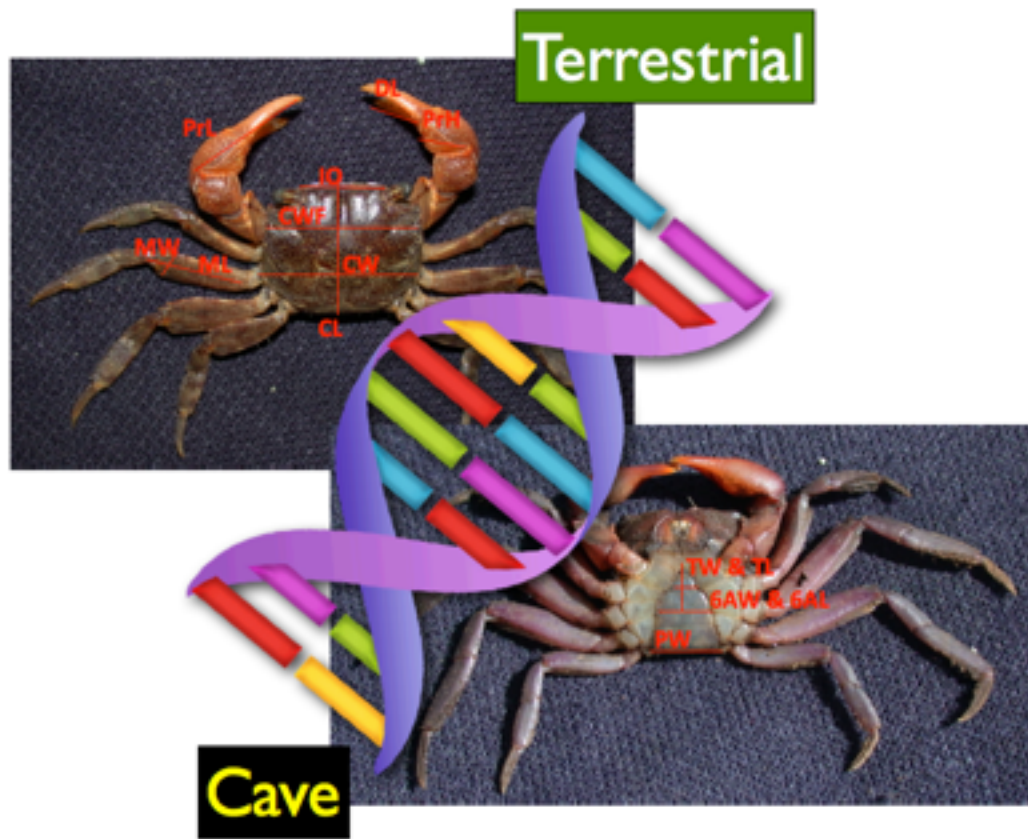


Osteopilus marianae

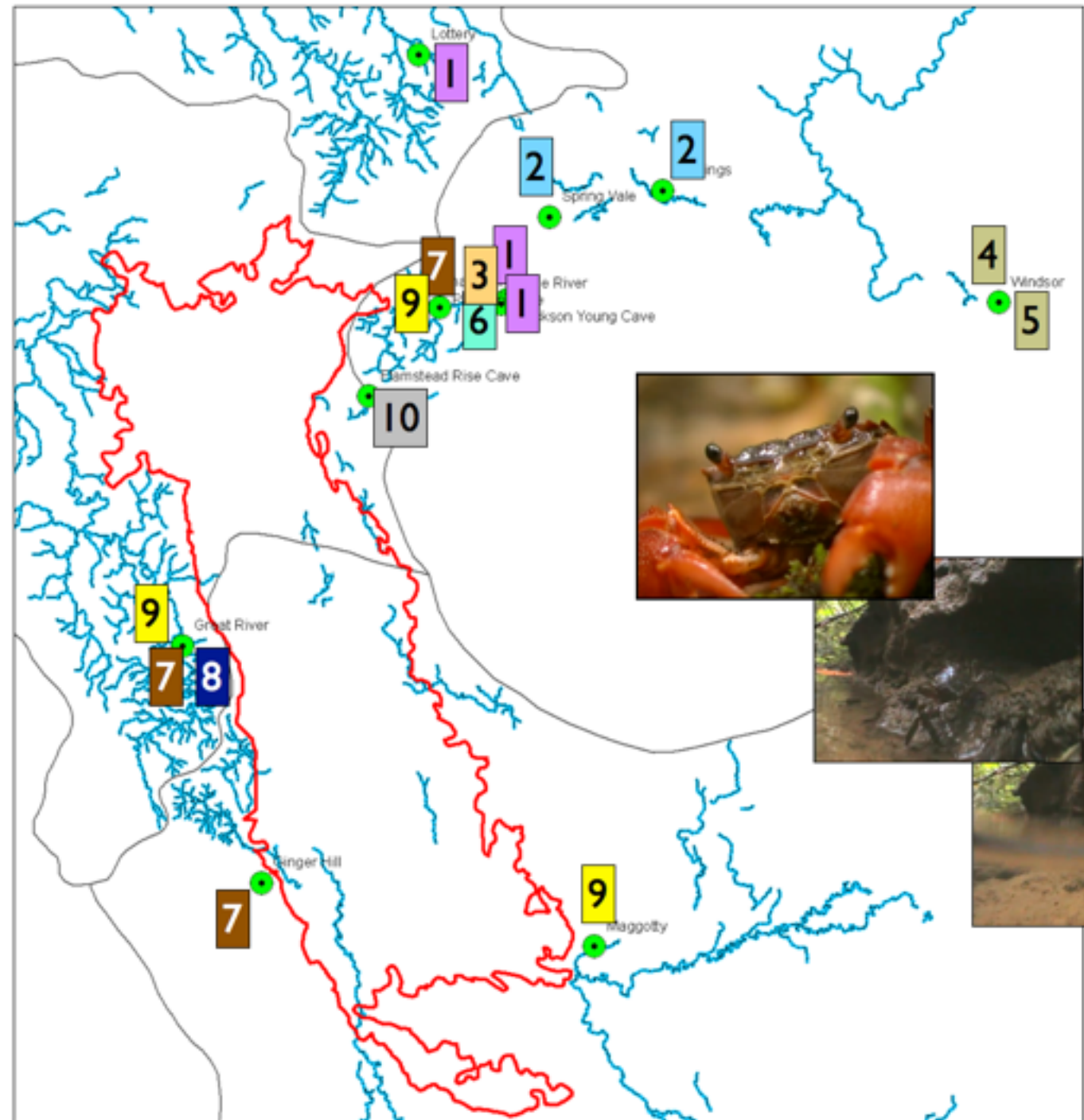
- Like Homerus, other endemic animals are both dependent on and biological indicators of the rainfall patterns in Cockpit Country.

Homerus & Friends: An Epic of Landscape Proportions

Sesarma fossarum Population haplotypes



Stemmer & Schubart 2016



- Still other endemic animals reveal the complexity of “post-rainfall” Cockpit Country: how does the rain move through the subterranean aquifer (HEAD’S UP: current watershed boundaries are wrong!)



Homerus & Friends: An Epic of Landscape Proportions

Bio-indicators of the quality of
Cockpit Country's ecosystem service of rain



Landscape-driven
climate



Predictable
patterns of rain



Cockpit Country - Voices from Jamaica's Heart
(c) Jamaica Environment Trust
Vagabond Media, LLC
https://www.youtube.com/watch?v=x2Psj_UcqQY

IMPORTANT CONCLUSION

from *Homerus & Friends*

All of the Cockpit Country landscape
is ecologically sensitive!



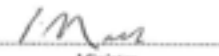
Homerus & Friends: An Epic of Landscape Proportions

2006 - present



SPECIAL CONDITIONS

1. (a) The Licensee shall give fourteen (14) days notice to owner of or occupier of the lands not owned by him before commencing prospecting operations thereon.
(b) A copy of each such notice shall be forwarded to the Commissioner of Mines.
2. (a) With each half-yearly report required under the Mining Regulations, 1947, and on termination of this Special Exclusive Prospecting Licence, the Licensee shall render to the Commissioner of Mines or his duly authorized agent complete reports, including copies of raw data and the interpretation of geochemical, geophysical, drilling, mapping and all other forms of prospecting. Drill cores shall be kept for examination.
(b) The Licensee shall submit with these reports the following:-
 - (i) the island's 1:50,000 topographical sheet showing the specific areas over which prospecting operations have been carried out;
 - (ii) a map of scale not smaller than 1:5,000 showing the outlines and the positions of all sample points and boreholes.
3. All boreholes shall be plugged to avoid injury to animals and any pits or trenches dug during prospecting shall be filled to the satisfaction of the Commissioner of Mines.
4. On completion of the exploration programme, the Licensee shall submit the following to the Commissioner of Mines or his duly authorized agent:-
 - (i) Orebody drill maps
 - (ii) Analytical data from exploration in hard and soft copy format
 - (iii) Splits of red mud samples
5. Safety, health and environmental best practices shall be adhered to during the prospecting operations.
6. The Mines and Geology Division of the Ministry of Science, Technology, Energy and Mining should be afforded free access to the area to conduct geological investigations.
7. The Licensee shall submit to the Commissioner of Mines on or before January 1 each year, a Work Plan for review and approval, showing plans by the Licensee for
8. Ecologically sensitive and archeologically important sites should be avoided as far as possible.


Minister

The documentation that all of Cockpit Country is ecologically sensitive at multiple scales in the landscape moves us forward in our efforts to prevent bauxite mining, namely that ***ecologically sensitive and archeologically important sites should be avoided....***

Homerus & Friends:

3 Components of All WRC Projects



Research



WINDSOR RESEARCH CENTRE 2012

Policy Brief

Ecosystem Service Valuation of Cockpit Country

HIGHLIGHTS

1.1 ECOSYSTEM SERVICES
Cockpit Country provides valuable services including plants, animals, cultural artifacts, water supply and natural products.

1.2 BAUXITE MINING
The Jamaica Government and Conservation Groups have been debating the best use of Cockpit Country. To mine or not to mine has to be based on proper information.

1.3 NATURAL RESOURCE VALUATION
The economic value of non-market resources such as ecosystem services and environmental quality can be used to make decisions about managing natural areas like Cockpit Country.

1.4 STUDY
Over 2,000 persons were randomly surveyed across the island of Jamaica. A Contingent Valuation survey was used to collect data to estimate the economic value preserving the ecosystem services of Cockpit Country.

1.5 VALUE OF COCKPIT COUNTRY
This study shows that the value of maintaining the Cockpit Country in its current state is approximately Jamaican \$2.4 billion per year (US \$79.8 million). The Jamaican population has a high consumer surplus associated with preserving a decline in the environmental quality of Cockpit Country.

Introduction
Cockpit Country is one of two large remaining areas of primary forest in Jamaica and is a last refuge for many of Jamaica's endemic plants and animals. It is an island-within-an-island, surrounded by a sea of agriculture and rural communities. Cockpit Country provides essential ecosystem services including water filtration, carbon storage, wildlife habitat, recreational opportunities and scenic beauty. Ecosystem services are the direct or indirect contributions that ecosystems make to human well-being.

Jamaica's Cockpit Country is recognized nationally and internationally for its unique biodiversity, its cultural heritage, and for the ecosystem services it provides to central-west Jamaica. This ecosystem is under imminent threat from bauxite mining and limestone quarrying. In the past, the Government of Jamaica (GoJ) has not considered indirect costs such as loss of biodiversity, risks to

ecosystem services and costs to communities, in its decision process, which emphasizes short-term, foreign exchange benefits. One way to improve decision-making is to develop an economic case for the conservation of Cockpit Country. Part of this process is the use of non market valuation techniques to estimate values for ecosystem services for locations such as Cockpit Country. Non-market valuation techniques are extensively applied over a wide range of goods and services and their use as a tool for natural resource management policy is now fairly common across many countries.

Study Objectives
This study aims to contribute to, and inform the policy and decision making process in Jamaica for natural resource management. The purpose of this ecosystem service valuation study was to measure Cockpit Country Ecosystem service values using a recognized non-market valuation technique. The estimates of value

STUDY PREPARED BY PETER E.T. EDWARDS, Ph.D. NATURAL RESOURCE ECONOMIST
For Windsor Research Centre

Advocacy



Info Sharing



Info Sharing: 2015



Mines & Geol
(Go)



Noranda
Bauxite



ENGOs



To see an example of how Cockpit Country communities are fighting to protect Cockpit Country (incl. under the umbrella of Homerus), please watch Simon Crosskill's "Live at 7" investigative team's report on 12th August 2015, beginning 4 minutes into the programme:
<<http://www.cvmtv.com/videos.php?type=live7#clip=1339403>>

Homerus & Friends:

3 Types of WRC Partners



Local



COCKPIT COUNTRY
Local Forest Management Committees



JAMAICA 4-H CLUBS

"To Make the Best Better"



DUTCH ZOO
CONSERVATION FUND



Forestry
Department

Protecting
our Forests;
Sustaining Lives



National



Environmental
Law
Alliance
Worldwide

International



THE NATIONAL
FOREST PROGRAMME
FACILITY



International
Tropical
Conservation
Fund



AAGE V. JENSEN CHARITY FOUNDATION

**CRITICAL ECOSYSTEM
PARTNERSHIP FUND**



MacArthur
Foundation

