

**WK V**

## LANDSCAPE STRUCTURES: EDGES AND BOUNDARIES

Referensi:  
Dramstad, Olson & Forman (1996) dan Farina (1998)

Dr. KASWANTO, SP, MSi

**PENGANTAR EKOLOGI LANSKAP (ARL 230)**  
**DEPARTEMEN ARSITEKTUR LANSKAP**  
**SEMESTER GENAP**  
Tuesday, 14 March 2017



**JADWAL KULIAH  
PENGANTAR EKOLOGI LANSKAP**

Week	Date	Topic	PIC
I	14 Feb 2017	Introduction to Landscape Ecology	HSA
II	21 Feb 2017	FOUNDATION: Times Changes, Objective	HSA
III	28 Feb 2017	Development of Landscape Ecology; Landscape Ecology Today	HSA
IV	7 Mar 2017	Patches	KAS
V	14 Mar 2017	Edges and Boundaries	KAS
VI	21 Mar 2017	Mosaics	SWI
VII	28 Mar 2017	Corridors and Connectivity	SWI
VIII		Mid-term Exam (UTS)	

**References:**





1. Principles and Methods in Landscape Ecology → Almo Farina
2. Landscape ecology principles in Landscape Architecture and Land use Planning → Wenche E. Dramstad, James D. Olson, Richard T.T. Forman
3. International Journals

PPT would be uploaded to the BLOG


### Landscape Structure

- Size, shape, composition, number and position of patches, or landscape elements within a landscape (Molles 2007).
- Patch**: a contiguous area sharing a narrow range of values for an identified set of descriptive parameters; a more-or-less homogeneous region




### Landscape Structure

- Mosaic (Natural)**: the entire landscape, divided into any number of patches of discrete size and shape; an abstraction of the actual landscape



### Landscape Structure - Mosaic (Anthropogenic)



Source

Landscape Structure - Mosaic (GIS-based)



Source: Wy

Restoration Ecology - Landscape Perspective

- Patch
  - All patches have edges
    - Edges have abiotic environments that are different from the interior of a patch → differences in biota & processes
    - The larger a patch, the more interior (core) it contains

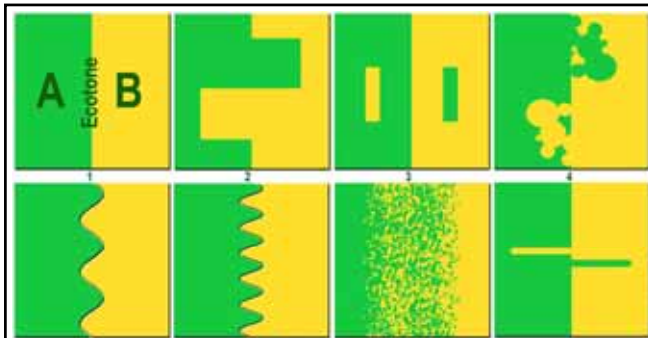
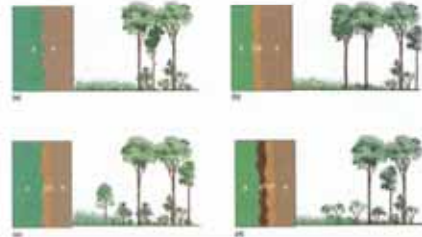


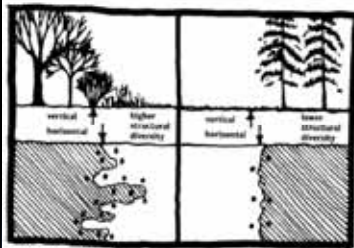
Fig.1 & 2 show simple ECOTONES with equal and homogeneous surfaces in both cases. Fig.3 shows an inclusion of each medium in the other, creating multiple ecotones, which are shown in a more complex form in figure 4. Fig. 5 & 6 show the edges of forests or banks treated in such a way as to lengthen the ecotone considerably without excessively modifying the environment. Fig.7 shows a common interpenetration of media (such as that found at the edge of a forest). Fig.8 shows an ecotone that could have been formed by an animal modifying its environment.

# EDGES

5 principles

## Edge

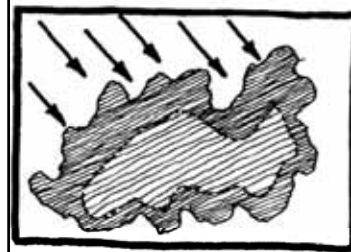
EDGE STRUCTURE



**E1. Edge structural diversity**  
Vegetative edges with a high structural diversity, vertically or horizontally, are richer in edge animal species.

**E1. Keragaman Struktur Edge**

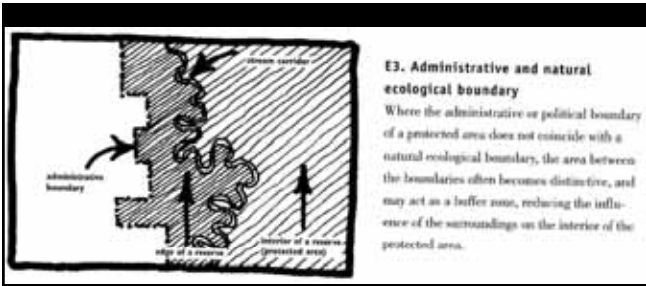
Edge tanaman dengan keragaman struktur yang tinggi, baik vertikal maupun horizontal, lebih banyak memiliki spesies hewan Edge.



**E2. Edge width**  
Edge width differs around a patch, with wider edges on sides facing the predominant wind direction and solar exposure.

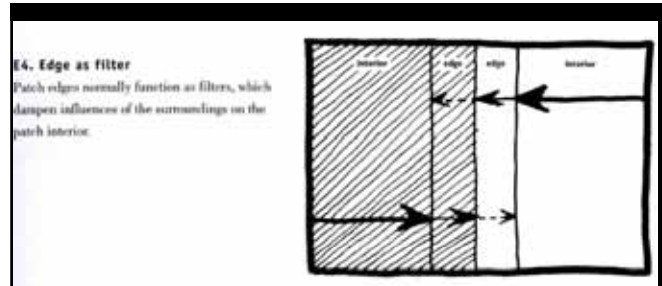
**E2. Ketebalan Edge**

Ketebalan / Kelebaran Edge berbeda di sekeliling patch, dengan Edges yang lebih lebar berada pada bagian yang menghadap arah angin dan cahaya.



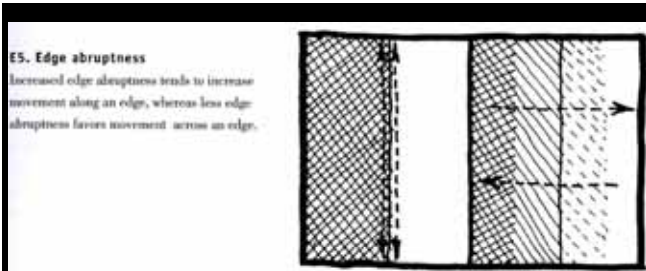
**E3. Administrative and natural ecological boundary**  
 Where the administrative or political boundary of a protected area does not coincide with a natural ecological boundary, the area between the boundaries often becomes distinctive, and may act as a buffer zone, reducing the influence of the surroundings on the interior of the protected area.

**E3. Batas Ekologi Administratif dan Alami**  
 Batas administratif atau politik tidak bertepatan dengan batas ekologi, kawasan diantara *boundary* sering menjadi berbeda dan bisa menjadi zona penyangga (*Buffer Zone*), mengurangi pengaruh sekelilingnya terhadap *interior* Kawasan Lindung (Protected Area).



**E4. Edge as filter**  
 Patch edges normally function as filters, which dampen influences of the surroundings on the patch interior.

**E4. Edge sebagai penyangg (Filter)**  
*Patch Edge* biasanya berfungsi sebagai penyangg (*filters*), yang mana mengurangi/mereduksi pengaruh sekeliling terhadap *patch interior*.

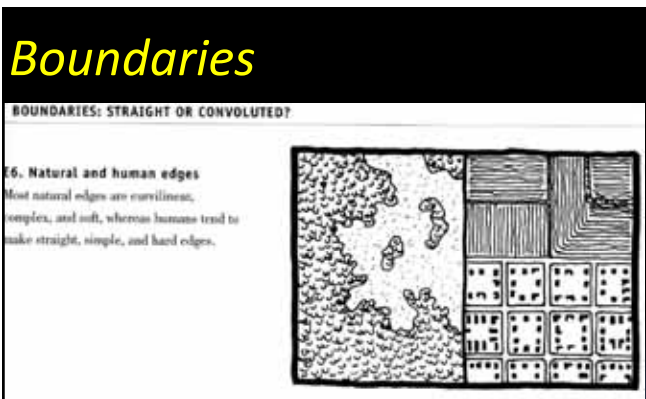


**E5. Edge abruptness**  
 Increased edge abruptness tends to increase movement along an edge, whereas less edge-abruptness favors movement across an edge.

**E5. Kecuraman Edge**  
 Kecuraman *Edge* yang meningkat cenderung meningkatkan pergerakan **sepanjang** *Edge*, sementara *Edge* yang tidak curam cenderung membuat pergerakan **melintasi** sebuah *Edge*.

# BOUNDARIES

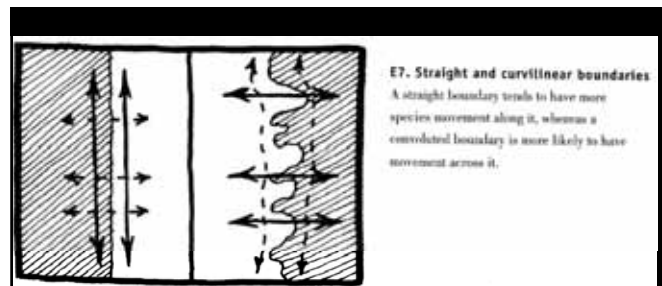
9 principles



**BOUNDARIES: STRAIGHT OR CONVOLUTED?**

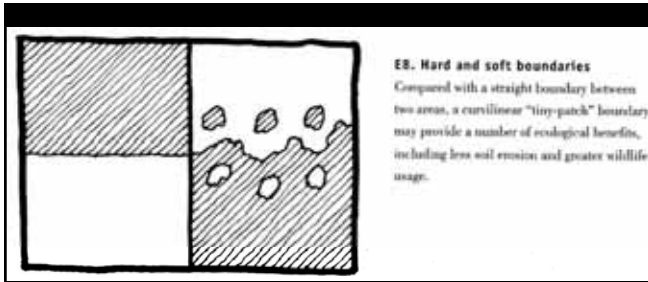
**E6. Natural and human edges**  
 Most natural edges are curvilinear, complex, and soft, whereas humans tend to make straight, simple, and hard edges.

**E6. Edge Alamiah dan Edge Manusia**  
 Kebanyak *Edge* **curvilinear, kompleks dan lunak**, sementara manusia cenderung untuk membuatnya **lurus, simpel dan kaku**.



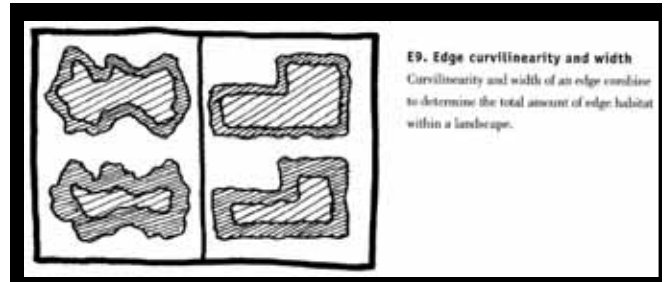
**E7. Straight and curvilinear boundaries**  
 A straight boundary tends to have more species movement along it, whereas a convoluted boundary is more likely to have movement across it.

**E7. Boundary STRAIGHT dan Boundary CURVILINEAR**  
**STRAIGHT Boundary** cenderung memiliki banyak pergerakan spesies di sepanjang tepiannya, berbeda dengan **CURVILINEAR Boundary** yang cenderung mempunyai pergerakan melintasi tepiannya.



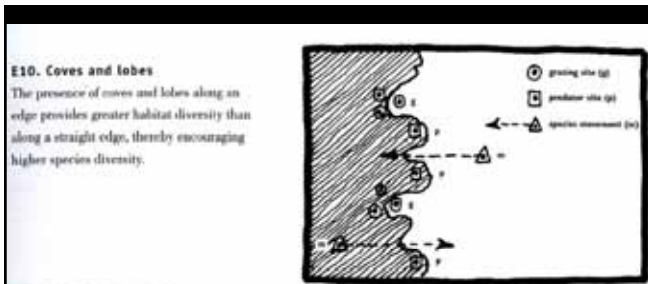
**E8. Hard and soft boundaries**  
Compared with a straight boundary between two areas, a curvilinear "irry-patch" boundary may provide a number of ecological benefits, including less soil erosion and greater wildlife usage.

**E8. Boundary KERAS dan Boundary LUNAK**  
Bila dibandingkan dengan **HARD Boundary** di antara dua kawasan, **SOFT Boundary** cenderung memiliki banyak keuntungan ekologis, termasuk didalamnya erosi tanah yang sedikit dan satwa liar yang banyak.



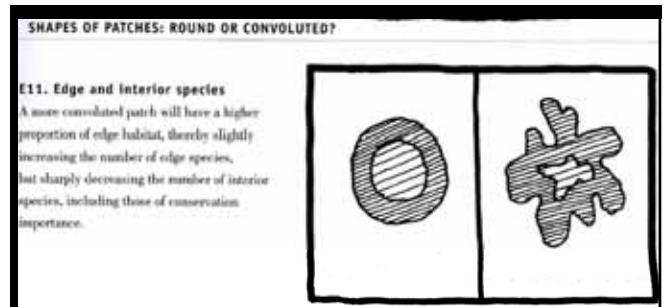
**E9. Edge curvilinearity and width**  
Curvilinearity and width of an edge combine to determine the total amount of edge habitat within a landscape.

**E9. Edge Curvilinearity dan Edge Width**  
Kombinasi *curvilinearity* dan lebar sebuah Edge menentukan jumlah Edge habitat di dalam lanskap. Pola organik memberikan Edge habitat yang lebih tebal dan beragam.



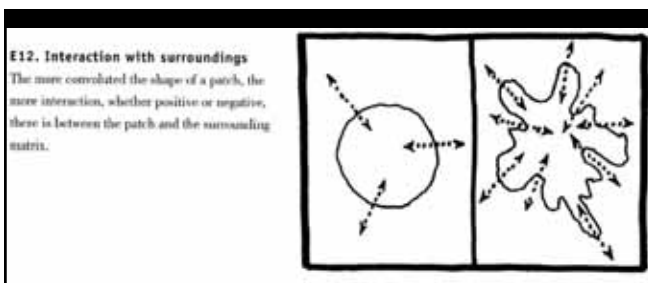
**E10. Coves and lobes**  
The presence of coves and lobes along an edge provides greater habitat diversity than along a straight edge, thereby encouraging higher species diversity.

**E10. Teluk (Coves) dan Tanjung (Lobes)**  
Keberadaan Teluk-Tanjung di sepanjang Edge menyediakan keragaman habitat yang lebih besar dibandingkan dengan Edge yang lurus, bahkan bisa meningkatkan keragaman spesies.



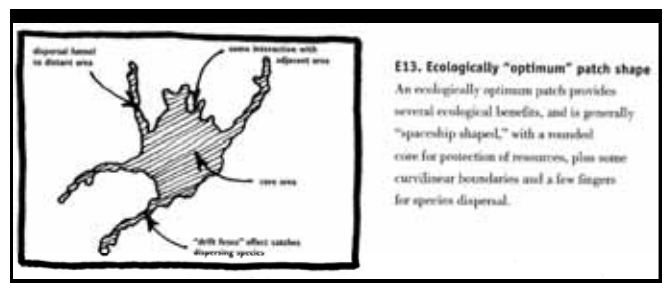
**E11. Edge and interior species**  
A more convoluted patch will have a higher proportion of edge habitat, thereby slightly increasing the number of edge species, but sharply decreasing the number of interior species, including those of conservation importance.

**E11. Spesies pada Edge dan Interior**  
Semakin berliku patch akan memiliki proporsi edge habitat yang lebih tinggi, sehingga meningkatkan jumlah spesies Edge, NAMUN menurunkan jumlah spesies interior, termasuk pada kawasan yang penting untuk dikoservasi.



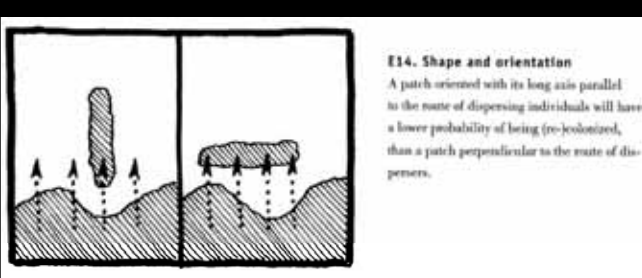
**E12. Interaction with surroundings**  
The more convoluted the shape of a patch, the more interaction, whether positive or negative, there is between the patch and the surrounding matrix.

**E12. Interaksi dengan sekelilingnya**  
Semakin berliku bentuk patch, semakin banyak interaksi, baik positif maupun negatif, interaksi terjadi antara *patch* dan *matrix* di sekelilingnya.



**E13. Ecologically "optimum" patch shape**  
An ecologically optimum patch provides several ecological benefits, and is generally "spaceship shaped," with a rounded core for protection of resources, plus some curvilinear boundaries and a few fingers for species dispersal.

**E13. Bentuk Shape "OPTIMUM" secara Ekologis**  
Patch yang secara ekologi OPTIMUM menyediakan beberapa keuntungan ekologis, dan biasanya seperti "**SPACESHIP SHAPED**", dengan inti yang membulat untuk melindungi sumberdaya, plus beberapa **CURVILINEAR BOUNDARY** dan beberapa "**FINGERS**" untuk penyebaran spesies.



**E14. Shape and orientation**  
 A patch oriented with its long axis parallel to the route of dispersing individuals will have a lower probability of being (re-)colonized, than a patch perpendicular to the route of dispersers.

**E14. Bentuk dan Orientasi**

Patch yang berorientasi sepanjang axis paralel dengan rute berpencarnya individu akan memiliki peluang yang rendah untuk di **RE-KOLONISASI** daripada patch yang tegak lurus dengan rute penyebaran.

# CASE(S)

## Edges and Boundaries

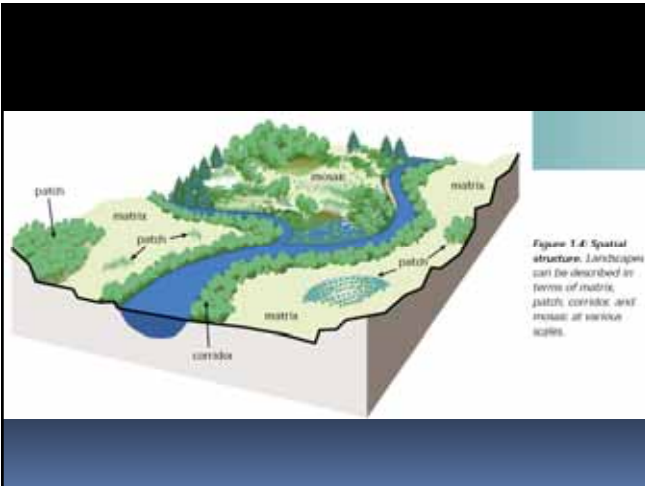


Figure 1.6: Spatial structure. Landscapes can be described in terms of matrix, patch, corridor, and mosaic at various scales.

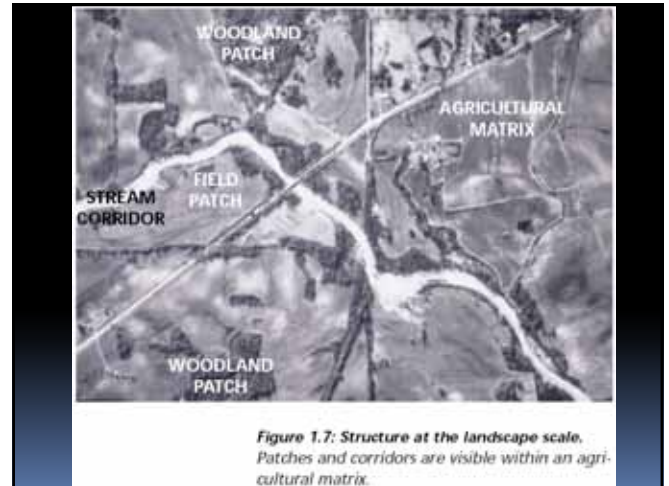


Figure 1.7: Structure at the landscape scale. Patches and corridors are visible within an agricultural matrix.



Figure 1.8: Structural elements at a stream corridor scale. Patches, corridors, and matrix are visible within the stream corridor.

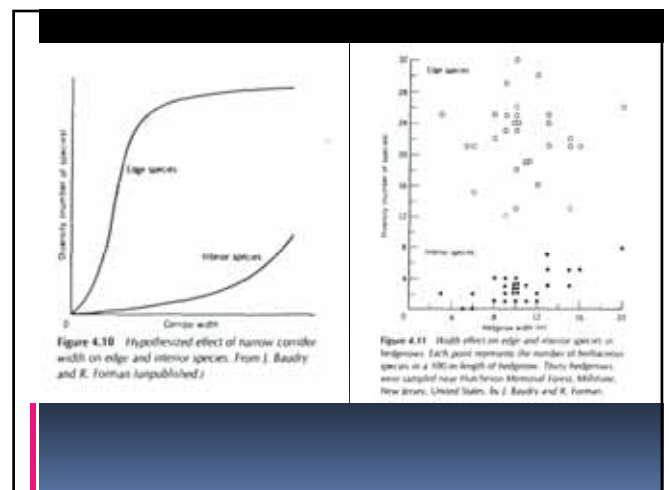
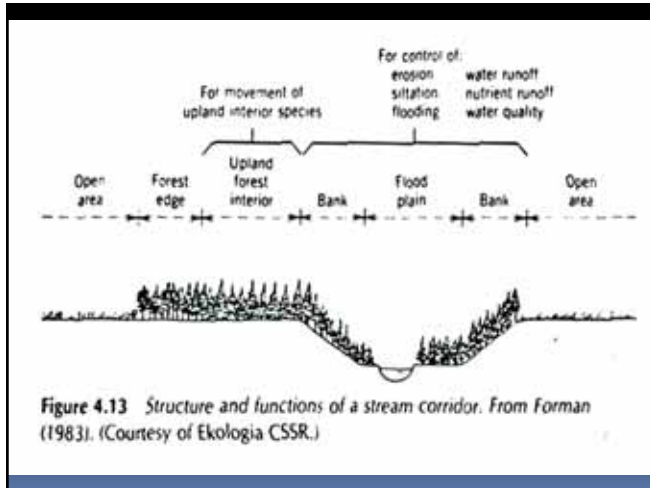


Figure 4.10: Hypothesized effect of narrow corridor width on edge and interior species. From J. Baudry and R. Forman (unpublished).

Figure 4.11: Width effect on edge and interior species in hedgerows. Each point represents the number of herbaceous species in a 100-m length of hedgerow. Forty hedgerows were sampled near Hutchison Memorial Forest, Millstone, New Jersey, United States. By J. Baudry and R. Forman.



### Habitat Edges

- The outlying boundary area of a patch exposed to the surrounding matrix
- **Edge effect:** The effect the patch edge has on the persistence of an organism
  - Effect is based upon resource availability, as well as exposure to predation and parasitism

## Boundaries

The **TRANSITION** zone between two distinct landscape elements (e.g. patch and matrix) is variously called:

- an **EDGE**
- an **ECOTONE**
- a **BOUNDARY**

## BOUNDARIES

- This **TRANSITION** area possesses some characteristics of both landscape elements but is neither completely one nor the other. Therefore, some people refer to an **ECOTONE** as a landscape element (habitat type) unto itself.
- **EDGES** are often **DRIER** and **HOTTER**, with more weedy species, than the patches of which it is an edge. Others recognize that although it may have some emergent properties, an edge/ ecotone/boundary's **PRIMARY FUNCTION IS AS A BARRIER** (permeable or impermeable) to **ECOLOGICAL FLOWS** (movement of matter [including organisms] and energy).

**Contact Address:**  
[kaswanto@ipb.ac.id](mailto:kaswanto@ipb.ac.id)  
[www.kaswanto.staff.ipb.ac.id](http://www.kaswanto.staff.ipb.ac.id)

**FB Regan Leonardus Kaswanto**

*Catatan:*  
 Setiap pengambilan material, copy & paste sebagian atau keseluruhan material ini harap mensitasi sumber dan mencantumkan link blog.  
 Terima kasih