



**Transitions climatique, énergétique et  
écologique pour une planète durable**

# Stratégies d'adaptation de l'Anthropocène

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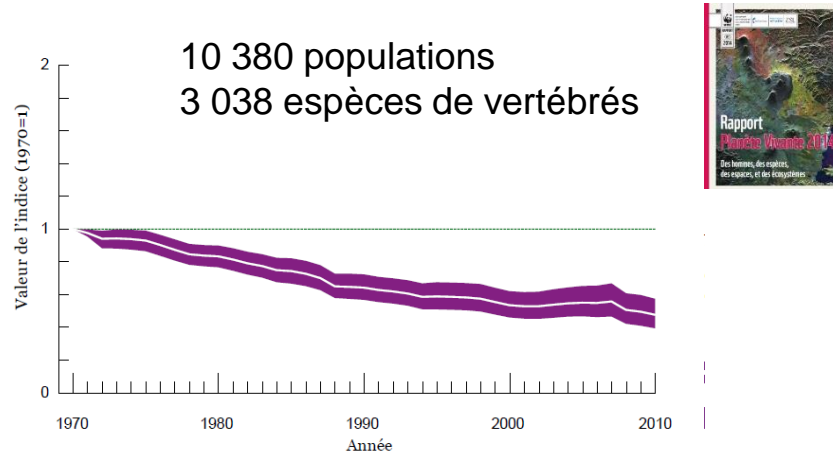
<sup>2</sup>ESE, UMR8079 UPSud-CNRS-AgroParisTech, Université Paris-Saclay

Paris 4 Juillet 2016

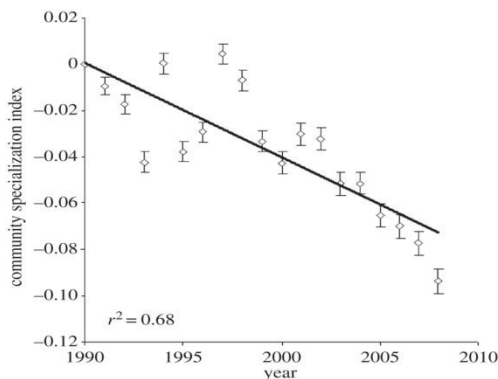


# Anthropocène et Biodiversité

## Effondrement des abondances

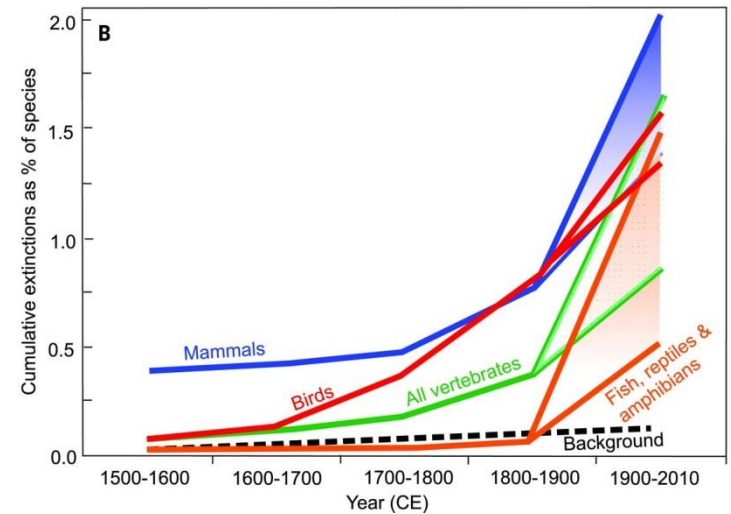


## Homogénéisation biotique



Le Viol I., et al.  
*Biology letters*, 2012

## Accélération des extinctions



Waters C.N., et al. *Science*, 2016

# Facteurs d'érosion

## Impacts humains croissants

$$I = P \times A \times T \quad \text{Ehrlich P.R., } \textit{TREE}, 2009$$

- Perte et fragmentation d'habitats
- Surexploitation
- Introduction d'espèces invasives
- Pollutions
- Changements climatiques



# Pourquoi conserver la biodiversité ?

## Ethique environnementale

- Valeur intrinsèque, valeur instrumentale

- ▣ Fin en soi ou moyen pour d'autres fins

- Vucetich J.A., et al. *Conserv. Biol.* 2015

- Justus J., et al. *TREE*, 2009

- Biocentrisme, écocentrisme, anthropocentrisme, pragmatisme

- ▣ « Old » vs « New conservation »

- Callicot J.B; Rolston III H.; Norton B.; Larrère C.; Maris V.

- ...

# Nécessité d'une approche évolutive

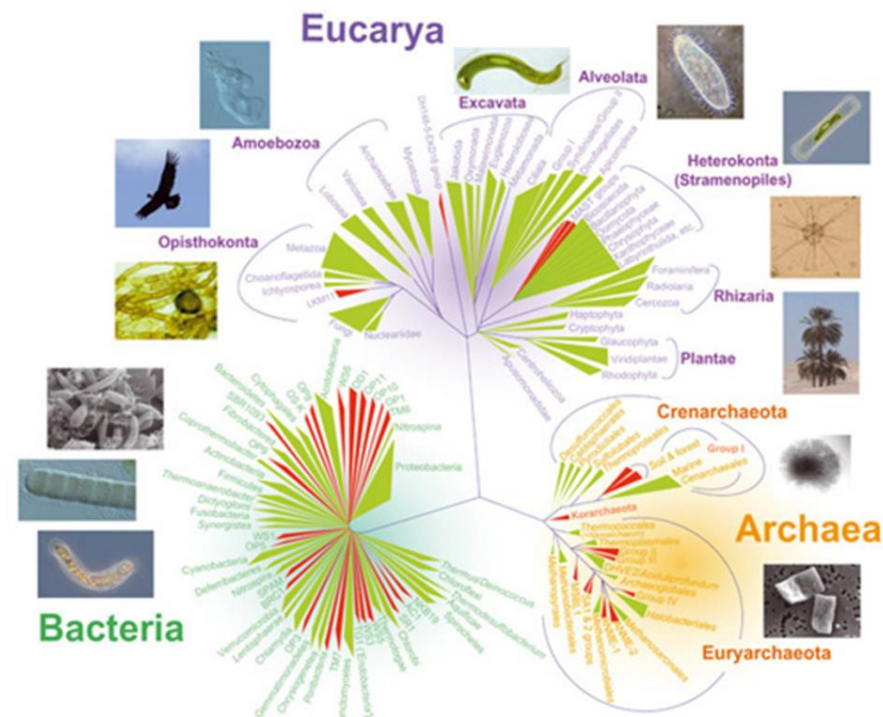


Mettre en perspective les débats à court terme

- Reconnecter les histoires évolutives des humains et non-humains
- Comprendre les conséquences évolutives des impacts humains
- Comprendre les inerties des trajectoires humaines
- Envisager les scénarios de transitions possibles

# Histoire évolutive partagée

- Valeur adaptative
  - ▣ Phénotypes vecteurs de génotypes
  - ▣ Processus épigénétiques, plasticité phénotypique
  - ▣ Taux de croissance des populations
  - ▣ Compétition, prédation, parasitisme
  - ▣ Coopération intra- et interspécifique



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# Histoire évolutive partagée

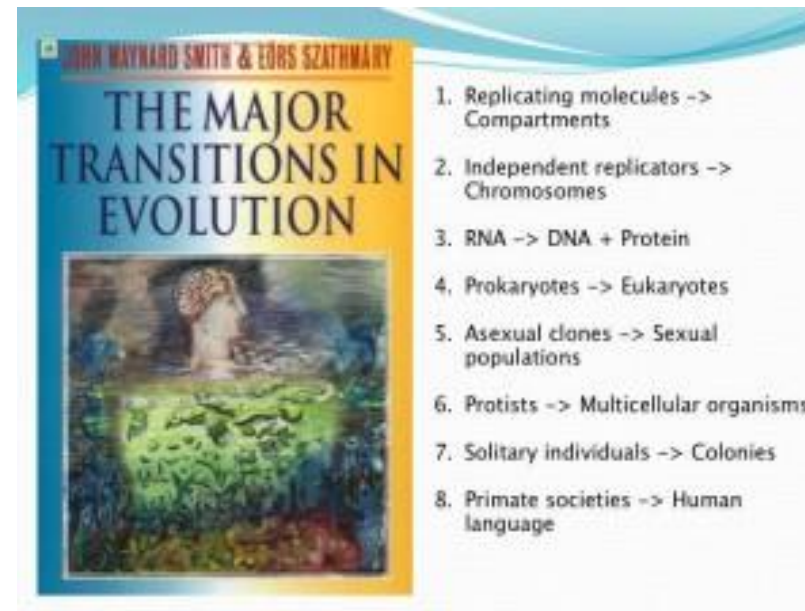
## □ Valeur adaptative

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## □ Transitions évolutives majeures

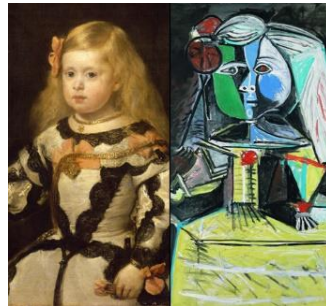
“a collective name for a group of events [...], during which natural selection transformed formerly free-living organisms into mere parts in new, higher-level wholes.”

Clarke, E. *J. of Biosciences* 2014



# Bien être humain au delà de la valeur adaptative

- Evolution des capacités cognitives, liens sociaux, construction de niche
- Résilients vis-à-vis des fluctuations environnementales
- Energie croissante pour les fonctions sensorielles et cognitives au-delà de gains en valeur adaptative
- Conscience individuelle et recherche de bien-être
- Emancipation phénotypique ?



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# Impacts évolutifs anthropiques

## □ Domestication



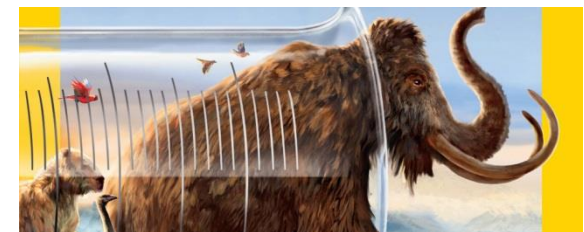
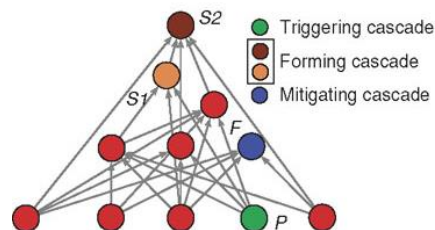
## □ Effets directs et indirects des approches par services

### □ Ex: pêcheries, trophées



## □ Effets directs et indirects des stratégies de conservation

### □ Ex: cascades d'extinction, translocations, de-extinction...



# Quelles interactions humains / non-humains ?

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SHOULD WE ...

abandon attempts  
at biodiversity  
conservation?

# Quelles interactions humains / non-humains ?

## Roots

SHOULD WE ...

INTRINSIC VALUE

CONSERVATION

WILDERNESS


abandon attempts  
at biodiversity  
conservation?

None


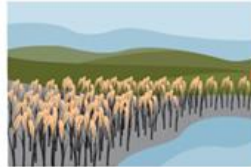
None

None


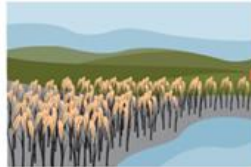

# Quelles interactions humains / non-humains ?

|  | Roots           |              |            | Challenges  |
|--|-----------------|--------------|------------|---|
| <b>SHOULD WE ...</b>                           | INTRINSIC VALUE | CONSERVATION | WILDERNESS | ECOSYSTEM SERVICES (ES)   |
| abandon attempts at biodiversity conservation? | None            | None         | None       | Runaway consumption of biodiversity resources<br> Blind Anthropocene |


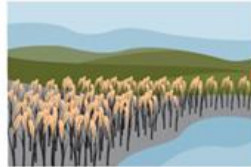


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| conserve for the resilience of future human generations? | Human fitness   |              | None       | Long-term provisioning and regulating ES      |                            |



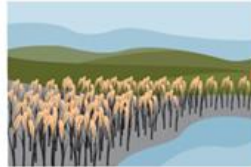


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| conserve for the resilience of future human generations?    | Human fitness    |              | None              | Long-term provisioning and regulating ES      |                            |
| conserve for the immediate well-being of human individuals? | Human well-being |              | Scenic wilderness | Short-term provisioning and cultural ES       |                            |



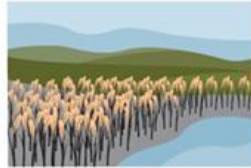



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| conserve for the well-being of future human generations?    | Human well-being and fitness |              | Scenic wilderness | Long-term provisioning, regulating, and cultural ES |                           |






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|   | Roots                        |  |                   | Challenges  |   |  |
|---|------------------------------|--|-------------------|---|---|--|
| SHOULD WE ...   | INTRINSIC VALUE              | CONSERVATION   | WILDERNESS        | ECOSYSTEM SERVICES (ES)                             |   |  |
| abandon attempts at biodiversity conservation?              | None                         | None   | None              | Runaway consumption of biodiversity resources       |  <p>Blind Anthropocene</p> |  |
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| conserve for the immediate well-being of human individuals? | Human well-being             |  | Anthropocentric   | Scenic wilderness                                   | Short-term provisioning and cultural ES   |  <p>Deliberate Anthropocene</p> |
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| SHOULD WE ...   | INTRINSIC VALUE                                  | CONSERVATION   | WILDERNESS                 | ECOSYSTEM SERVICES (ES)                       |   |   |
| abandon attempts at biodiversity conservation?                      | None   | None   | None                       | Runaway consumption of biodiversity resources |  <p>Blind Anthropocene</p>   |   |
| conserve for the resilience of future human generations?            | Human fitness                                    |  | None                       | Long-term provisioning and regulating ES      |    <p>Deliberate Anthropocene</p> |   |
| conserve for the immediate well-being of human individuals?         | Human well-being                                 |  | Anthropocentric            | Scenic wilderness                             |   | Short-term provisioning and cultural ES             |
| conserve for the well-being of future human generations?            | Human well-being and fitness                     |  |                            | Scenic wilderness                             |   | Long-term provisioning, regulating, and cultural ES |
| conserve for the well-being of future human generations and nature? | Human well-being and fitness<br>Nonhuman fitness | Evocentric   | Wildness beyond wilderness | Long-term evolutionary trajectories beyond ES |  <p>Deliberate overcoming of the Anthropocene</p>  |   |

# Quelles interactions humains / non-humains ?

|   | Roots  |                 |                            | Challenges  |   | Consequences             |         |
|---|--|-----------------|----------------------------|---|---|--------------------------|---------|
| SHOULD WE ...   | INTRINSIC VALUE                                  | CONSERVATION    | WILDERNESS                 | ECOSYSTEM SERVICES (ES)                             |   | EVOLUTIONARY TRANSITIONS | IMPACTS |
| abandon attempts at biodiversity conservation?                      | None   | None            | None                       | Runaway consumption of biodiversity resources       |  Blind Anthropocene                          | Minor                    | Major   |
| conserve for the resilience of future human generations?            | Human fitness                                    | Anthropocentric | None                       | Long-term provisioning and regulating ES            |    | Deliberate Anthropocene  | Major   |
| conserve for the immediate well-being of human individuals?         | Human well-being                                 |                 | Scenic wilderness          | Short-term provisioning and cultural ES             |    |                          |         |
| conserve for the well-being of future human generations?            | Human well-being and fitness                     |                 | Scenic wilderness          | Long-term provisioning, regulating, and cultural ES |   |                          |         |
| conserve for the well-being of future human generations and nature? | Human well-being and fitness<br>Nonhuman fitness | Evocentric      | Wildness beyond wilderness | Long-term evolutionary trajectories beyond ES       |  Deliberate overcoming of the Anthropocene | Major                    | Minor   |

# Implémentation des transitions

- Eviter les extinctions ciblées sur les espèces ou communautés
- Eviter les pressions de sélection directionnelles des échelles locales aux échelles globales
- Placer dans une perspective évolutive les recherches sur les
  - ▣ socio-écosystèmes, espaces protégés,
  - ▣ services écosystémiques, agro-écosystèmes,
  - ▣ adaptation aux changements climatiques
  - ▣ solutions fondées sur la nature,
  - ▣ biotechnologies, biologie synthétique ...

# Implémentation des transitions

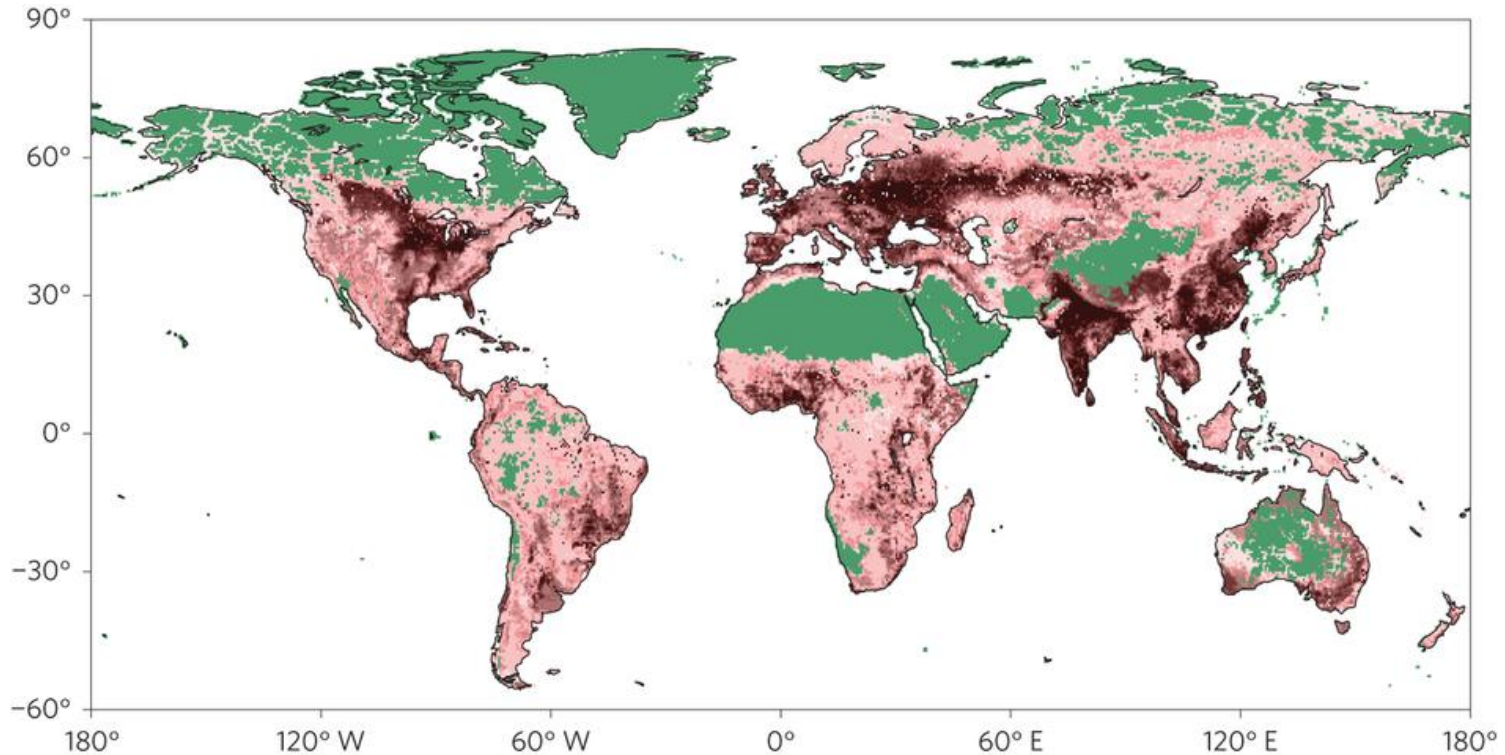
- Éthique evocentrée
  - ▣ Focus sur les processus
  - ▣ De pourquoi “conserver” à pourquoi “destruire” ?
  - ▣ Pas un retour en arrière, une transition majeure
  
- Besoin d’approches transdisciplinaires
  - ▣ Interface fonctionnement / évolution
  - ▣ Ecologie historique
  - ▣ Sciences de l’Homme et des sociétés, écologie, évolution




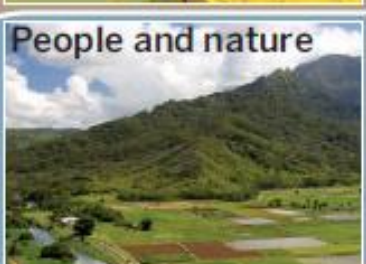
# Merci de votre attention !



# Anthropocène et Biodiversité

■ Espace peu altéré par les humains (wilderness and non productive area) : [24,5 - 28,5]%



| Rough timeline | Framing of conservation   | Key ideas  | Science underpinning                                    |
|----------------|---|--|---|
| 1960           | <b>Nature for itself</b><br>     | Species<br>Wilderness<br>Protected areas   | Species, habitats<br>and wildlife ecology               |
| 1970           |   |  |   |
| 1980           | <b>Nature despite people</b><br> | Extinction, threats and<br>threatened species<br>Habitat loss<br>Pollution<br>Overexploitation | Population biology,<br>natural resource<br>management   |
| 1990           |   |  |   |
| 2000           | <b>Nature for people</b><br>     | Ecosystems<br>Ecosystem approach<br>Ecosystem services<br>Economic values                      | Ecosystem functions,<br>environmental<br>economics      |
| 2005           |   |  |   |
| 2010           | <b>People and nature</b><br>    | Environmental change<br>Resilience<br>Adaptability<br>Socioecological systems                  | Interdisciplinary,<br>social and ecological<br>sciences |

Mace G., *Science*, 2014

**Changing views of nature and conservation.** Over the past 50 years, the prevailing view of conservation has changed several times, resulting, for example, in a shift in emphasis from species to ecosystems. None of the framings has been eclipsed as new ones have emerged, resulting in multiple framings in use today.