

# History and implications of the novel ecosystem concept

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“The principle of uniformitarianism emphasizes that the past, the present and future are not discrete units but a time continuum through which species and communities flow, change and evolve....”  
(Rull 2010)

Because all ecosystems are constantly changing, all contemporary ecosystems are “geologically” novel. They did not exist in the past and will not exist in the future.

## **Introduction**

- Novel ecosystem concept
- Implications of the novel ecosystem concept
- The ecologist's dilemma – Why are novel ecosystems a problem for ecologists?

**Overview**

Synonyms for novel in the ecological literature include semi-natural, quasi-natural, degraded, domesticated, anthropogenic, no-analog, etc.

Novel Ecosystem Concept

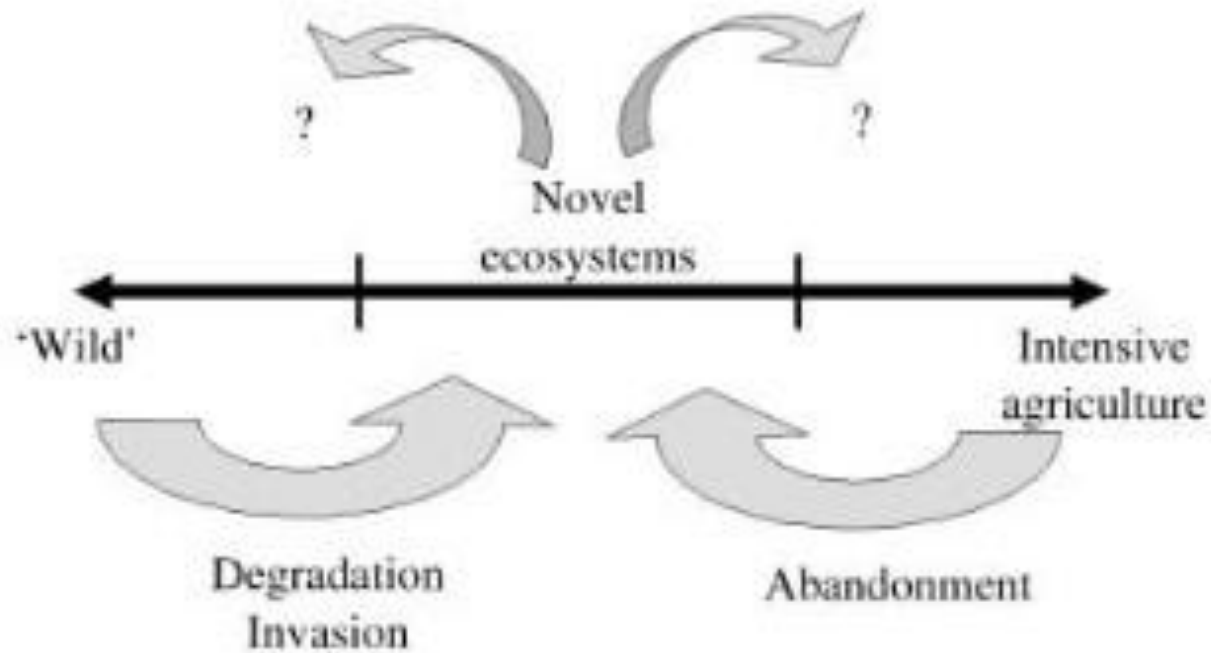


Figure 1 Novel ecosystems arise either from the degradation and invasion of 'wild' or natural/seminatural systems or from the abandonment of intensively managed systems.

(Hobbs et al. 2006)

# Novel ecosystems

Novel ecosystems are assemblages of species in a given area that have not previously occurred.

Novel ecosystems are not under human management, but they are mostly the result of direct or indirect human activities.

## **Novel Ecosystems**

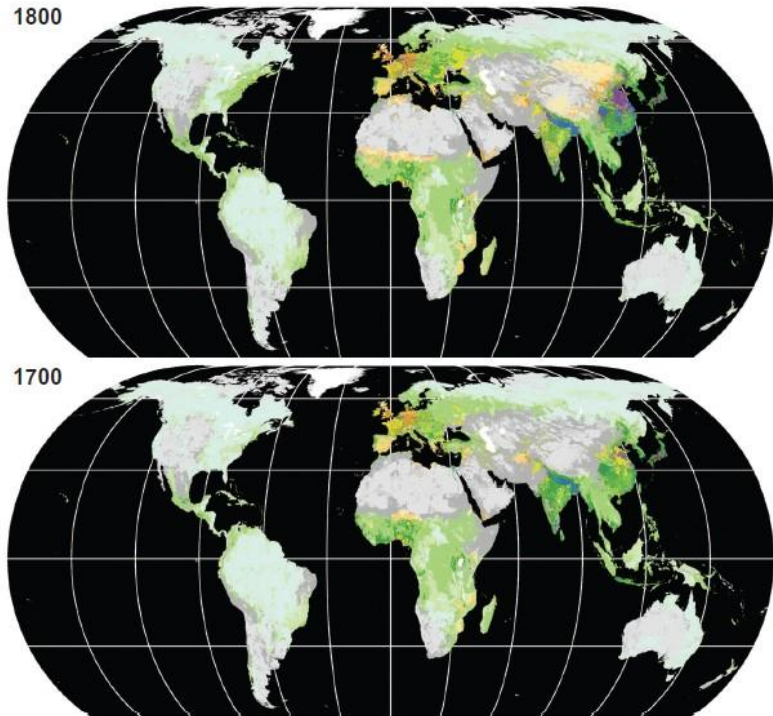
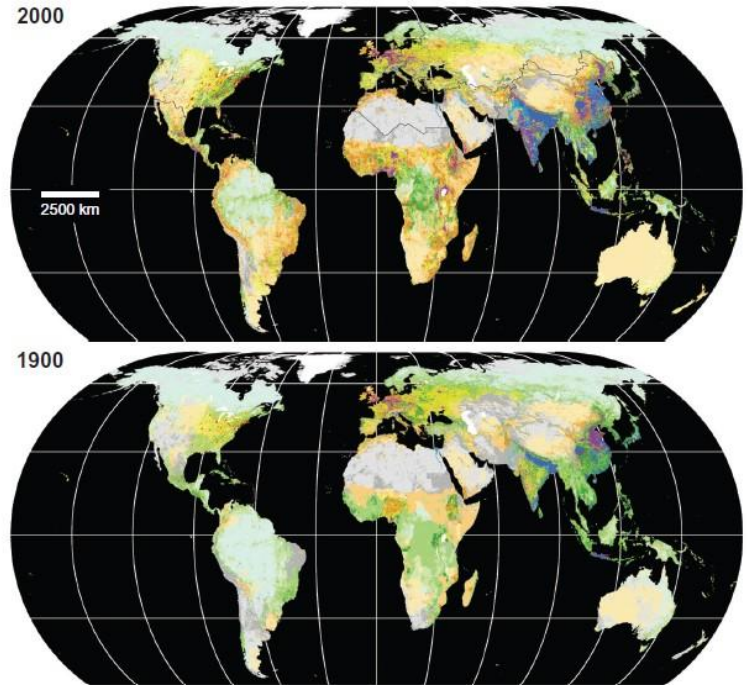


Figure 1 Continued

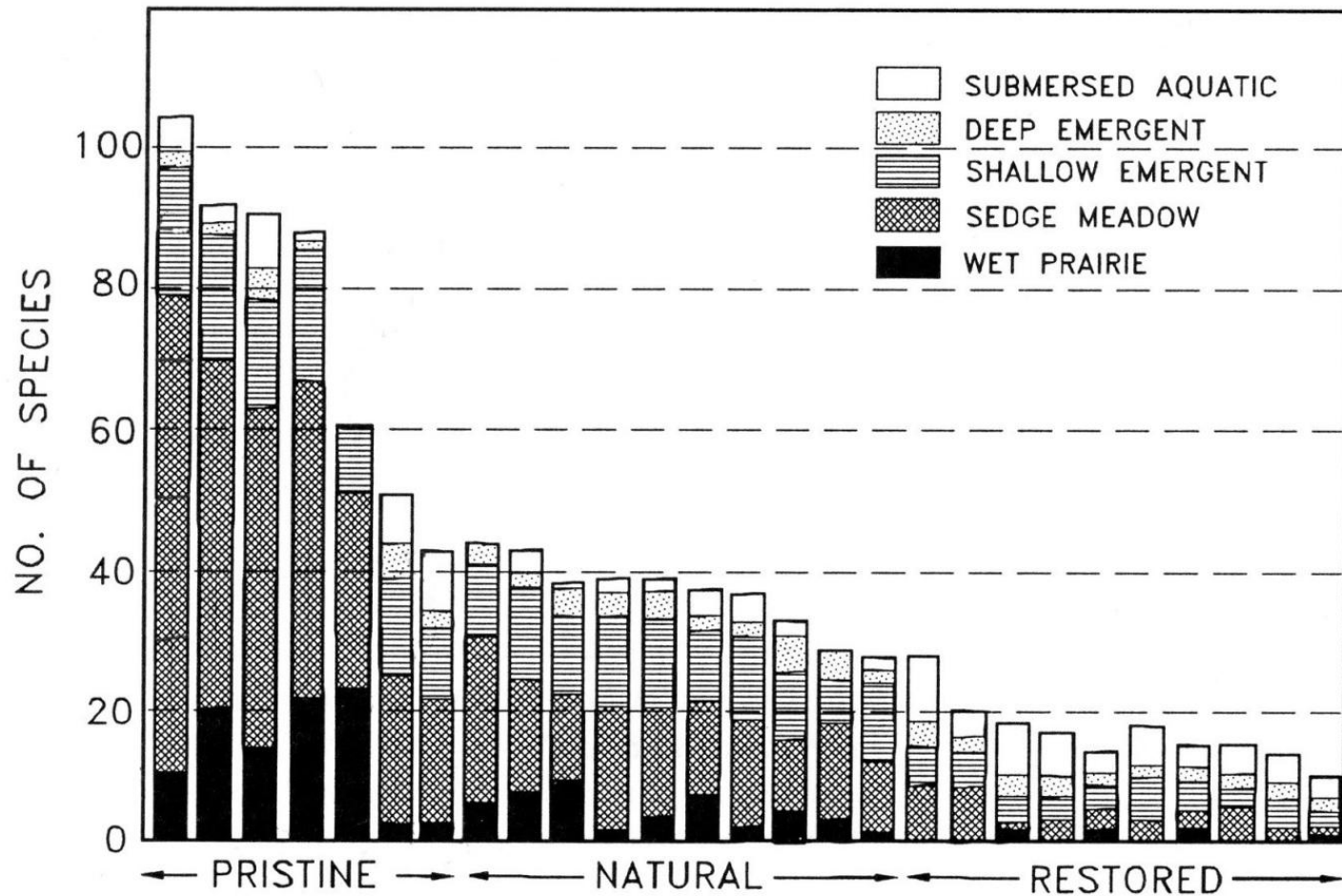
(Ellis 2010)



Anthromes Used		Croplands	Seminatural	Wild
Urban	Residential irrigated croplands	Residential woodlands	Wild woodlands	
Mixed settlements	Residential rainfed croplands	Populated woodlands	Wild treeless & barren lands	
<b>Villages</b>	Populated croplands	Remote woodlands		
Rice villages	Remote croplands	Inhabited treeless & barren lands		
Irrigated villages	<b>Rangelands</b>			
Rainfed villages	Residential rangelands			
Pastoral villages	Populated rangelands			
	Remote rangelands			

Figure 1 Anthropogenic biomes, 1700–2000 (anthromes class descriptions in Table 1). Region boundaries (2000) are distinguished by black lines; same regions as Ellis & Ramankutty (2008). Eckert IV projection.

# Novel Ecosystems



# Novel Ecosystems



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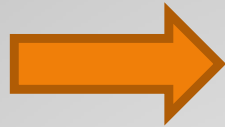
(With apologies to Gertrude Stein)

Implications of the novel ecosystem  
concept

# Novel Ecosystem in the Kissimmee Chain of Lakes (Wiley Kitchens and colleagues)



Hydrilla  
(exotic)



Island Apple Snail  
(exotic)



Snail Kite (native,  
endangered species)

## Implications

How novel are novel ecosystems?

Hedgepeth (1980): “In most of these examples of intentional or accidental [species] introductions we have no clear evidence of the effects of the introduction on other species, for the most part because we have no adequate baselines of pre-introduction conditions for evaluating the impact of the introductions.”

Many of the negatives associated with novel ecosystems are speculative or inferred. See Lavoie (2010) and Trexler et al. (2000).

**Implications**

The same thermodynamic, energetic, or informational constraints (your favorite theorist here) that control the development of pristine ecosystems constrain the development of novel ecosystems.

Novel ecosystems are structured and behave just like other ecosystems – trophic structure, nutrient cycles, food webs, etc.

**Implications**

Novel ecosystems are reservoirs for much of the world's biodiversity and genetic diversity.

Much of the world's ecosystem services (e.g., oxygen production, carbon sequestration, nutrient removal, etc.) are being provided by novel ecosystems.

Novel ecosystems are best adapted to current and future conditions.

## **Implications**

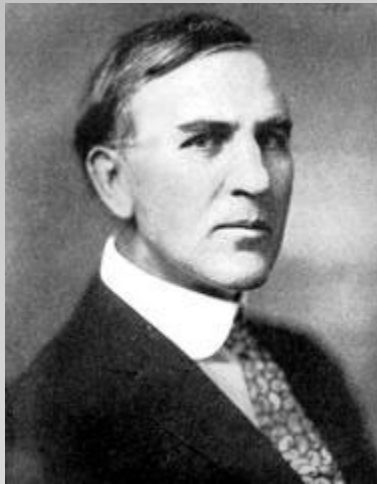
Because of their training, ecologists consider anthropogenic, novel ecosystems inferior to pristine ecosystems. Why is this the case?

Novel ecosystems – love them or leave them?

## The Ecologist's Dilemma

# How did the human-nature dualism originate?

F. E. Clements



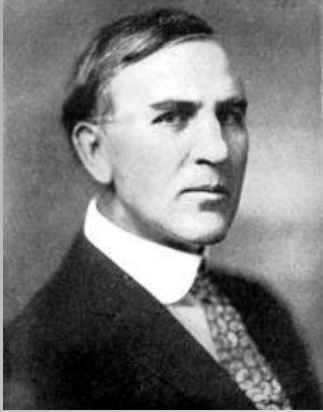
VS

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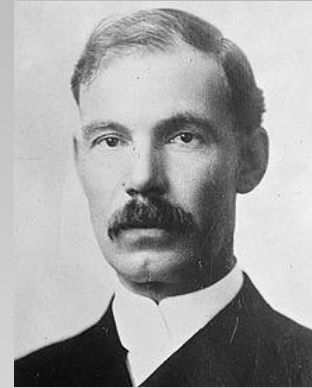


## The Ecologist's Dilemma

F. E. Clements



E. A. Ross

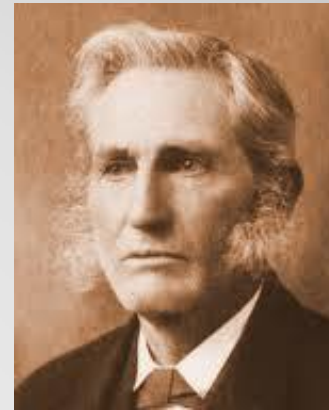


VS

Henry Chandler Cowles



Lester Frank Ward



# The Ecologist's Dilemma



Demarcation disputes between early academic ecologists and sociologists resulted in the human-nature dualism that informs both fields.

Ecology needs to recognize that man is part of nature and that human activities have and will continue to impact all ecosystems.

As scientists, we should not treat human impacts any differently from other kinds of impacts.

## **The Ecologist's Dilemma**

Once we accept that anthropogenic and pristine ecosystems are not fundamentally different, the ecologist's dilemma largely disappears.

Ecologists need to study and learn to manage all ecosystems regardless of their origin.

## **The Ecologist's Dilemma**

Ecology (like evolution) has a strong historical dimension. Pristine or near pristine ecosystems are historically and culturally important just like cathedrals and castles.

Just like cathedrals and castles, they need to be preserved and restored as best they can.

## **The Ecologist's Dilemma**

- All contemporary ecosystems are “geologically” novel ecosystems. Today, most ecosystems are anthropogenic ecosystems.
- Novel ecosystems are not really all that novel, except in their species composition.
- We need to develop a new ecology that is not prejudiced by the human-nature dualism that resulted from demarcation disputes among early ecologists and sociologists.

## Summary

- Ecologists need to study and to learn to manage all ecosystems, regardless of their origin.
- Because of their historical and cultural importance, we need to preserve, as best we can, our remaining pristine or near pristine ecosystems.

## Summary