Testing the Application of Adaptive Governance of Common Pool Resources: An Archaeological Perspective

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NABO North Atlantic Biocultural Organisation

What is Adaptive Governance?

Elinor Ostrom's (1990) book *Governing the Commons* was the first systematic analysis of the long-term management of common pool resources (CPRs), which are "sufficiently large that it is difficult, but not impossible, to define recognized users and exclude others altogether" and the use of such resources detracts others' ability to benefit from them (Ostrom 2008:11). Analysis of hundreds of CPR cases has shown that **management systems must be localized to the conditions of the social-ecological system and be able to adapt to changing conditions and circumstances.** These management systems are termed *adaptive governance*. A set of **eight design principles have been identified that are present in successful cases of CPR adaptive governance** (Table 1). While these principles are designed to address the challenges of managing modern CPRs, we demonstrate they can be translated into concepts that also have utility in examining past management strategies.

The SES Framework and Archaeological Cases

Ostrom's (2007) Social-Ecological System (SES) Framework identifies first-tier variables that constitute a multi-tier framework for analyzing SESs (Figure 1). The first-tier variables can be further subdivided into 2nd-nth tier variables (Figure 2). Our research focuses on second-tier variables, which are used to define first-tier variables. This framework is a useful tool for understanding and characterizing SESs, so it is used here to collect detailed data regarding each of our case studies. Our methodology includes three stages:

1) **Identify second-tier variables supported by archaeological, historical, and environmental data**
2) **Describe each case study using Ostrom's (1990) narrative format**
3) **Determine which design principles are present in each case**

Our case studies have the benefit of historic documents, but the written record is often biased. **Behavioral changes preserved in the archaeological record are key to documenting actual implementation strategies.** Archaeological CPR cases provide long-term perspectives on management regimes and can offer a higher resolution of self-organization and institutional arrangements than historic data alone (Table 2).

North Atlantic Biocultural Organisation Case Studies

Research conducted by **NABO** (www.nabohome.org) focuses on the Norse expansion into the North Atlantic during the 9th and 10th centuries. This research has **identified two examples of CPR management that begin at** *landnám*. The grazing practices of the Faroe Islands persist into the present—a 1,100-year history of successful management (Thomson et al. 2005). Woodland management on Iceland is still a concern, but recent research reveals that management strategies were implemented in core stands of woodland.
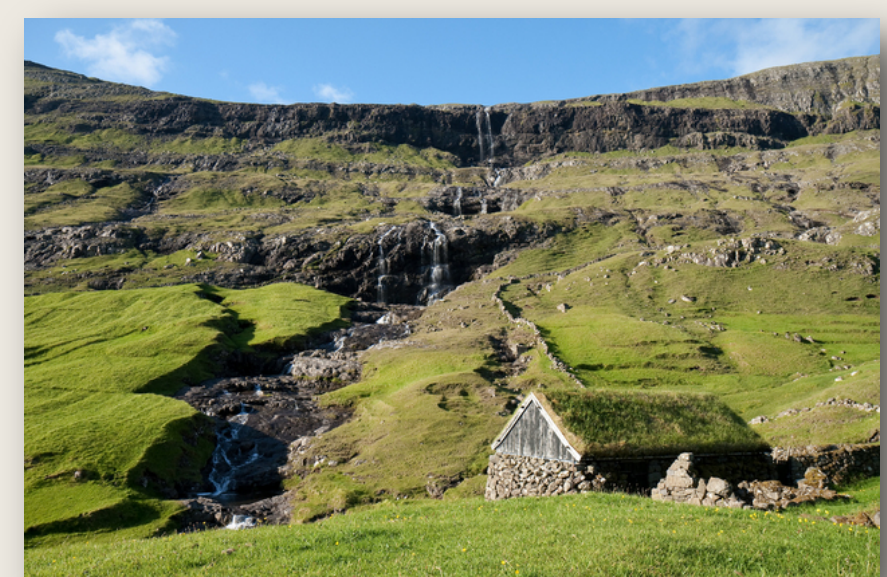

Table 1. Adaptive governance design principles for both North Atlantic case studies.

Grazing System of the Faroe Islands		Adaptive Governance Design Principle	Woodland Management in South Iceland	
Degree	Present?		Present?	Degree
Low	Yes	Clearly defined boundaries	Yes	Low
Moderate	Yes	Proportional equivalence	No	--
Low	Yes	Collective-choice arrangements	No	Moderate
--	Possible	Effective monitoring	Possible	--
--	Possible	Graduated sanctions	Possible	--
Low	Yes	Conflict-resolution mechanisms	Yes	Low
Low	Yes	Minimal right to organize	No	Low
Moderate	Yes	Nested enterprises	Yes	Moderate

Figure 1. A multi-tier framework for analyzing an SES (reproduced from Ostrom 2007:15182, Figure 1).

Figure 2. Second-tier variables of SES Framework (reproduced from Ostrom 2007:15183, Table 1).

Social, Economic, and Political Settings (S)
S1- Economic development. S2- Demographic trends. S3- Political stability.
S4- Government settlement policies. S5- Market incentives. S6- Media organization.

Resource System (RS)
RS1- Sector (e.g., water, forests, pasture, fish)
RS2- Clarity of system boundaries
RS3- Size of resource system
RS4- Human-constructed facilities
RS5- Productivity of system
RS6- Equilibrium properties
RS7- Predictability of system dynamics
RS8- Storage characteristics
RS9- Location

Resource Units (RU)
RU1- Resource unit mobility
RU2- Growth or replacement rate
RU3- Interaction among resource units
RU4- Economic value
RU5- Size
RU6- Distinctive markings
RU7- Spatial & temporal distribution

Governance System (GS)
GS1- Government organizations
GS2- Non-government organizations
GS3- Network structure
GS4- Property-rights systems
GS5- Operational rules
GS6- Collective-choice rules
GS7- Constitutional rules
GS8- Monitoring & sanctioning processes

Users (U)
U1- Number of users
U2- Socioeconomic attributes of users
U3- History of use
U4- Location
U5- Leadership/entrepreneurship
U6- Norms/social capital
U7- Knowledge of SES/mental models
U8- Dependence on resource
U9- Technology used

Interactions (I) → Outcomes (O)
I1- Harvesting levels of diverse users
I2- Information sharing among users
I3- Deliberation processes
I4- Conflicts among users
I5- Investment activities
I6- Lobbying activities

O1- Social performance measures (e.g., efficiency, equity, accountability)
O2- Ecological performance measures (e.g., overharvested, resilience, diversity)
O3- Externalities to other SESs

Related Ecosystems (ECO)
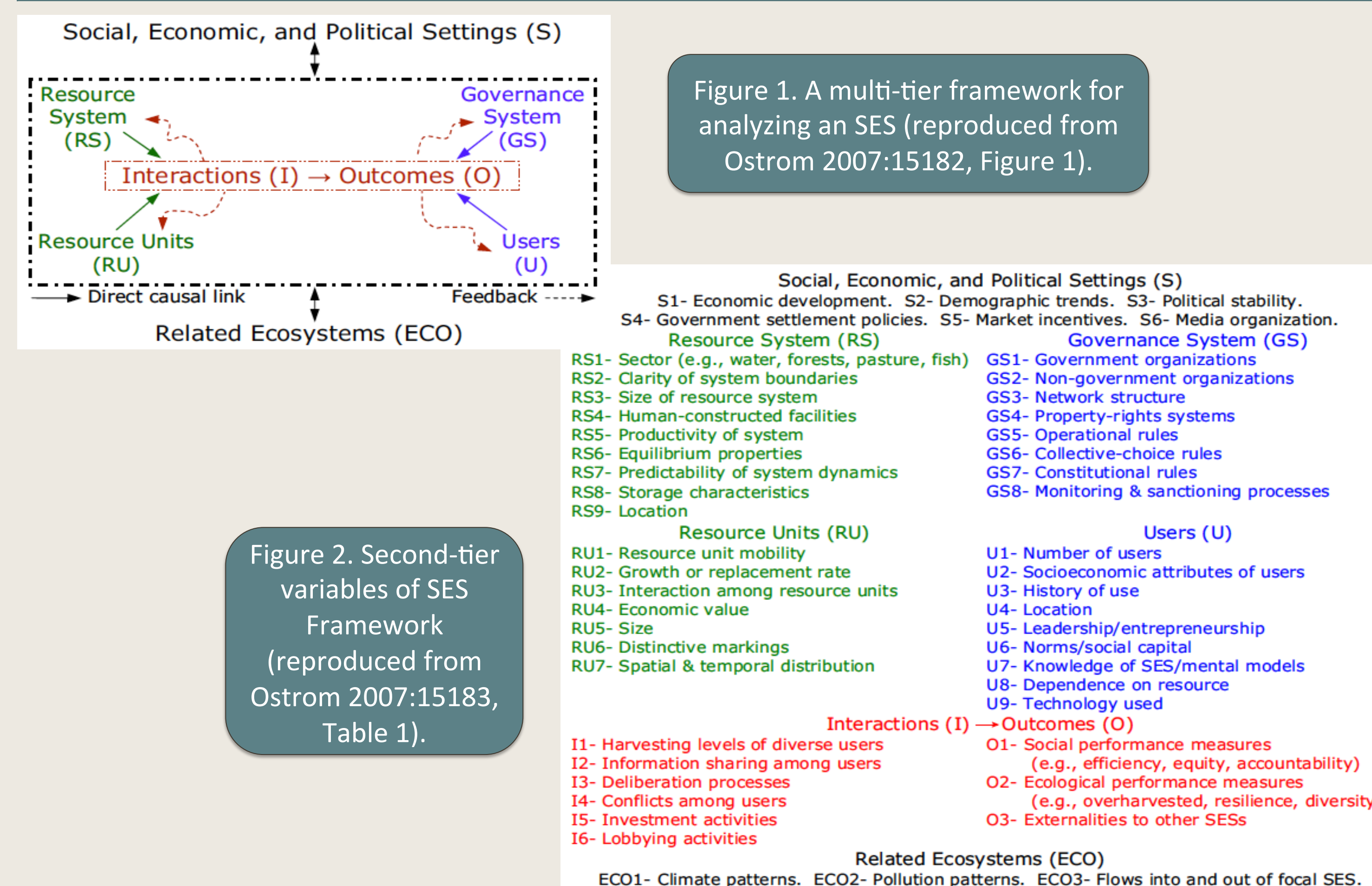ECO1- Climate patterns. ECO2- Pollution patterns. ECO3- Flows into and out of focal SES.

Table 2. Types of data used to evaluate the SES variables in each case study.

| First-Tier SES Variables	Archaeological Data	Historical Data	Environmental Data
Social, Economic & Political Settings	Settlement patterns, archaeofauna	Trade documents, political organization, records of social hierarchy	Resource distribution on landscape
Resource System	Archaeofauna, settlement patterns, archaeobotanical remains	Descriptions of landscape	Geomorphology, ecology, pollen record
Resource Units	Archaeofauna, settlement patterns	Resource documents, inventories	Geomorphology, ecology
Governance System	Settlement patterns, archaeobotanical remains	Written laws, treaties, etc	--
Users	Settlement patterns, archaeobotanical remains, archaeofauna	--	Pollen record
Interactions	Archaeofauna, settlement patterns, archaeobotanical remains	Descriptions of trade and commerce	--
Outcomes	Archaeobotanical remains	--	Geomorphology, ecology
Related Ecosystems	Settlement patterns	--	Climate proxies

Grazing System of the Faroe Islands
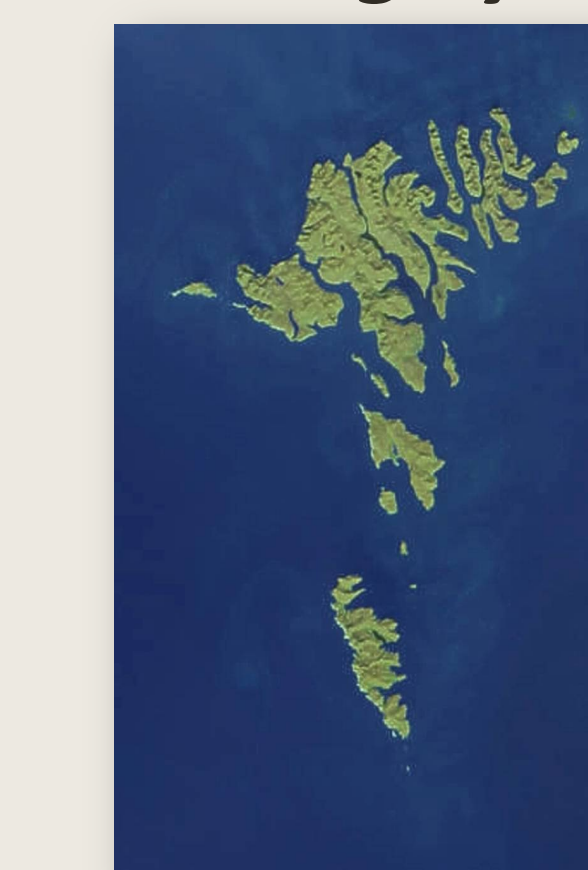
The Faroe Islands grazing system, including the allocation of grazing areas and restrictions on stock levels, were primarily decisions made at the community level. Grazing communities were composed of three to five family farms (Arge et al. 2005; Thomson et al. 2005). From *landnám* to approximately the 13th century, Faroese farms used a shieling system to raise their livestock. During the 12th century, this system transitioned into the *hagi* and *partir* field systems, which placed limits on the number of sheep that could be grazed in winter and summer based on each pasture's traditional and perceived carrying capacity. This system was self-governed by shepherds and recognized by the Faroese *Althing* in the form of the Sheep Letter of 1298.

Woodland Management in South Iceland

Severe deforestation occurred across Iceland following *landnám* resulting in the need to preserve core woodland areas in ecologically marginal areas, such as the Eyjafjallahreppur region. Distant chieftains or churches typically owned woodlands but local farmers were the harvesters; therefore, a disconnect existed between decision makers and harvesters. Archaeobotanical remains recovered from charcoal production pits provide evidence that woodlands in the Markarfljót Valley were diminishing or being over-exploited, yet woodlands still exist in this area (Church et al. 2007). The *Gragás* includes laws specifying the amount of wood to be harvested and prioritizing the purposes for which wood can be harvested. Woodlands were highly valued and, upon noticing their depletion, the Norse took action to ensure their long-term management.
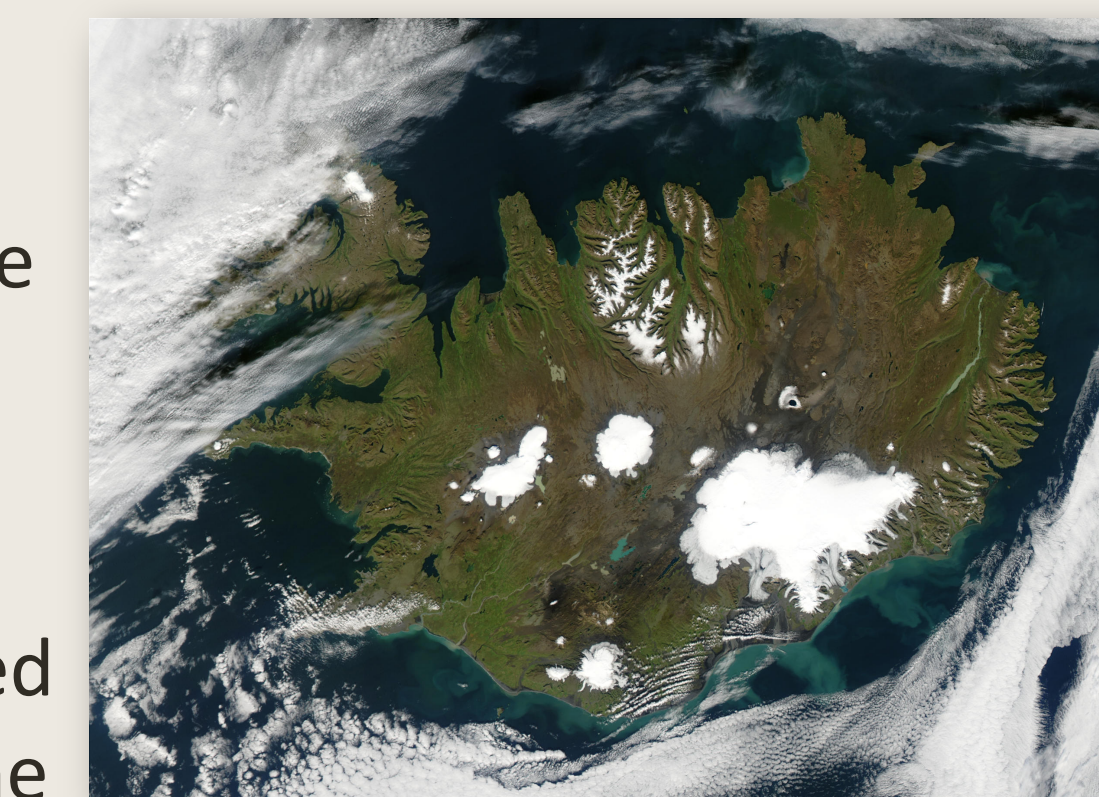
Conclusions

- SES Framework can be applied to archaeological cases
- Interdisciplinary approach is necessary
- Archaeological cases provide insights into the implementation of design principles and the costs/benefits associated with adaptive governance over the *longue durée*
- It appears that all design principles are essential for successful CPR management in the North Atlantic cases (Table 1)
- Archaeological data and analysis have a demonstrated utility in planning long-term, sustainable CPR systems for the present and future

Acknowledgements