Green Shores

Restoring fringe saltmarshes to the Tay & Eden Estuaries & the Dornoch Firth

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Coast Bordeaux 2017
Habitat restoration in context

- Convention on Biological Diversity 1992
- Aichi Targets 2011 to 2020

- Understand values
- Mainstream biodiversity
- Address incentives
- Sustainable production
- Halve rate of loss
- Sustainable fisheries
- Manage within limits

- Reduce pollution
- Reduce invasive spp.
- Minimize reef loss
- Protect areas
- Prevent extinctions
- Conserve gene pool
- Restore ecosystems

- Enhance resilience
- Implement Nagoya Prot.
- Revise NBSAPs
- Respect and conserve TK
- Improve knowledge
- Mobilize resources

- Eliminate subsidies harmful to biodiversity.
- Halve, or bring close to zero, the rate of loss of all natural habitats.
- Sustainably manage and harvest all fish and invertebrate stocks and aquatic plants.
- Reduce pollution to levels that are not detrimental to ecosystems and biodiversity.
- Control or eradicate prioritized invasive alien species.
- Minimize anthropogenic pressures on coral reefs.
- Conserve at least 17% of terrestrial and 10% of coastal and marine areas in protected zones.
- Prevent the extinction of known threatened species.
- Restore at least 15% of degraded ecosystems.

- Society of Ecological Restoration

[Image of Society of Ecological Restoration logo]
Historical saltmarsh restoration

JH Wilson 1910
‘vast acres of saltmarsh,
‘few signs of erosion’
‘turf stripped from
saltmarsh for golf links’

Craft et al, 1999 S.
alterniflora transplants, N.
Carolina, USA. 1974 (top),
after three years (middle)
and 21 years (bottom)

9th Century ‘spread ye rhizomes’
(over East Anglican mudflats)

Spartina anglica, Eden Estuary, 1947 to 1980
The Eden Estuary’s saltmarshes & shoreline

Cool oceanic, muddy, organic

Mediterranean, sandy, dry
The PhD study

BEFORE: early 2000s

AFTER: late 2000s
Saltmarshes, Seawalls & Storms: 2010 – 2013
USTAN, SEPA, RAF Leuchars & St Andrews Links Trust

- Two sites: 1,500 m² (500 linear metres) of *Bolboschoenus maritimus* (Sea Club Rush)

- Transplant survival rates between 40% and 90%, depending on year and site

- Limiting factors
  - Size of donor marsh
  - Winter wash out rate
  - Using volunteers
The application: Project 1
(USTAN, SNH & Fife Environment Trust)

• Greenhouse studies
  - Transplant yield increased twenty fold
  - Seeds relatively easy to germinate
  - Conditions for successful vegetative-based transplants
• Another four sites of Sea Club Rush planted (1,600 m² or 750 linear metres)

• Trials with other saltmarsh species successful

• More than 25,000 transplants from 2,500 plugs

• More than 250 volunteers and 100s of hours of heavy field labour, many practical problems to overcome
Restoration Phases
**Green Shores:** 2017 – 2020
(USTAN, Leader, St Andrews Links Trust, Royal Dornoch Golf Club, Fife Council, Ministry of Defence)

- Create coastal plant hub to develop propagation techniques and produce a supply of transplants for the restoration effort

Saltmarsh Grass (*Puccinellia maritima*)
Red Fescue (*Festuca rubra*)
Sea Plantain (*Plantago maritima*)
Sea Club Rush (*Bolboschoenus maritimus*)
Sea Aster (*Aster tripolium*)
Annual Glasswort (*Salicornia europaea agg.*)

Sea Lyme (*Leymus arenarius*)
Marram grass (*Ammophila arenaria*)

*Eelgrass* (*Zostera spp.*)

*Dwarf Hairgrass* (*Eleocharis parvula*)
- Deploy protective wave baffles to provide accommodation space for the creation of thousands of square metres of saltmarsh
Substantial investments to conserve biodiversity should provide significant environmental, economic and social benefits in return.

- £300,000 (one university, two community funders, two government agencies & four landowners)

- Significant returns?
  - Trials over 16 years: 80 m² to 2,000 m²
  - Phase I over 6 years: 1,500 m² to ?
  - Phase II over 2 years: 1,600 m² to ?

Aichi Target 15: Restore at least 15% of degraded ecosystems

- Eden Estuary shoreline is 10km long - so far 2.5km restored = 25%
Fringe saltmarsh restoration: my worst site
Fringe saltmarsh restoration: my favourite site