The seed conversation
Delivering at the scale for change

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Curtin University; The University of Western Australia, Kings Park and Botanic Garden
Seed underpins the global call to repair the planet

Restoration of Ecosystem Capacity in Support of Human and Environmental Wellbeing

RECALLING the World Conservation Strategy adopted in 1980 mentions restoration as a tool in Conservation many times,

NOTING that over 50 Resolutions and Recommendations have been adopted by IUCN’s members over the past 40 years |

Conserving specific Biomes (i.e., marine, wetlands, forests); and

Achieving significant global conservation initiatives, including gender equality, food sovereignty, protected |

NOTING FURTHER that ecosystem restoration is called for in relation to urban landscapes, best practices in Protected Areas management, cross-

IUCN Commission collaboration, water programme, REDD and extractive industries.

ACKNOWLEDGING that many IUCN members and partners are using ecological restoration as a core strategy to achieve conservation goals;

ACKNOWLEDGING FURTHER that:

The General Assembly of the United Nations on 25 September 2015 adopted a resolution entitled “Transforming our world: the 2030 Agenda for Sustainable Development” at the summit for the adoption of the post-

2015 development agenda;

The Parties to the United Nations Framework Convention on Climate Change adopted a decision that underscores the importance of “nature based solutions”, which includes restoration to:

The Parties to the Convention on Biological Diversity have committed by 2020 to:

The Bonn Challenge seeks to restore 150 million hectares of the world’s deforested and degraded lands by 2020; and

The Beijing Declaration of the contributors to the 1st World Forum on Ecosystem Governance concluded that:

Nature-based solutions, such as restoration and reforestation, are critical to mitigate and adapt to climate change and to maintain biodiversity and the ecosystem services it provides, and thus help sustain those services to both urban and rural communities, and the Sustainable Development Goals Discussion Group 1 at the 1st World Forum on Ecosystem Governance concluded in their report entitled “Conservation and restoration of ecosystem functions for human wellbeing” in relation to restoration concluded that “Governments should promote policies that …:

Promote negotiation among interest groups to defining goals for conservation and restorations.

Provide incentives for private and/or public financing of ecosystem restoration;

Policy-makers understand that learning processes are key and the relationships between … conservation and restoration of ecosystem services and social benefits, … are dynamic and moving; and

Adaptive approaches to all of these action items are required.”

RECOGNIZING the important role the IUCN Red List of Ecosystems is playing in assisting nations and ecosystem managers better understand the status of their ecosystems; and

RECOGNIZING FURTHER that in those cases where an ecosystem is determined to be at high risk of collapse it is crucial that every effort be pursued to restore such ecosystems’ capacity to sustain delivery of services essential to human and environmental wellbeing;

The World Conservation Congress, at its session in Honolulu, Hawaii, United States of America, 1-10 September 2016:

Calls on the Director General to ensure that Ecosystem Restoration figures prominently in IUCN’s strategies to meet conservation and development goals

Calls on IUCN Commission on Ecosystem Management to partner with the Society for Ecological Restoration to …

Urges the restoration community to …
Native Seed Usage in Australia

43,155 accessions and 6325 Australian species stored in Australian seed banks.

- 0.2% from managed seed production areas (SPA)
- < 1/3 precision sown
- Only legumes have seed enhancements
Get Smart to get the scale

- Seed farming – *getting the quantities to meet the global demand*
- Precision sowing technologies – *creating the niche*
- Germination on demand – *making every seed count*
INTERNATIONAL STANDARDS FOR THE PRACTICE OF ECOLOGICAL RESTORATION – INCLUDING PRINCIPLES AND KEY CONCEPTS

FIRST EDITION: December 2016

Tein McDonald, George D. Gann, Justin Jonson, Kingsley W. Dixon

SOCIETY FOR ECOLOGICAL RESTORATION
My prairie
All you can eat biodiversity ... but can seed science be globally applicable?

Issues are large
Including 60,000 abandoned mines
Many are large 4.5km x 1.5km deep
Leave it alone and what happens…

1960’s

2010

Image: Jeremy Shepherdson, Cliffs Natural Resources
The hills are alive … with the sound of biodiversity (the exception)
SYSTEMS WILL NEED INTERVENTION

Gondwanalink – largest landscape scale restoration in southern hemisphere

Mean Frequencies of species in Upland Yate soil-vegetation type

- 32 spp/ha species sown
- 11 spp/ha species established

- 4-8% Seeding efficacy
Anigozanthos manglesii - named from seed germinated and flowered in UK in 1830 - 172y to resolve this species has after-ripening!
Persoonia – continental scale intractable germination
ONE SIZE FITS ALL IN GLOBAL SEED USE
Building industry: science: community links

A case study in seed enhancement technology

Seed coating: science or marketing spin?
Seed enhancements can unlock the restoration roadblock constraint

![Graph showing the percent of seeds sown from germination to survival, with a failure point indicated.]

Courtesy Jeremy James
What can we learn from the big end of town
FILM COATING

ENCРUSTING

PELLETING

BENEFITS

Modifies SEED WEIGHT, SIZE, AND COAT PHYSICAL PROPERTIES

- Thin layer >20% seed weight
- Thick coat, original seed shape still evident
- Original seed shape is no longer visible, spherical shape.

- Standardize seeds size and weight
- Handling
- Precision Mechanical sowing
  - Flowability and ballistic
  - Protection from active compounds
The ‘standard’ in the seed industry
What we did

• 145 scientific publication from 1999 to 2016

• 191 seed coating products or services from the 7 major seed companies

• Analyzed:
  • materials
  • methods
  • treatment effects
INDUSTRY

• Do not provide information on material and protocols
• NO independent testing
• Do not publish

ACADEMIA

• Use and develop methods and approaches not suited for industry
• Topic not relevant to industry.
SEED COATING: SCIENCE OR MARKETING SPIN?

TRADE SECRETS

BINDER FILLERS

Monsanto

Bayer CropScience

Syngenta

DuPont

Pioneer
We’re on our own …

* WE = SCIENCE + SEED
  INDUSTRY + OUR COMMUNITIES

Or are we…
Think at the scale needed

- Seed Production Areas - SPA
- Precision Sowing Technologies – PST
- Germination On Demand - GOD
What WE* need to deliver in restoration

- We do it once
- The outcome is predictable
- Product is replicable
- Rehabilitate from 10’s to 1000’s to millions of ha.

* WE = SCIENCE + SEED INDUSTRY + OUR COMMUNITIES
NATIVE SEEDS FOR RESTORATION

LEARN MORE
Early origins of seeds

What the fossils say:
Small stature plants; rapid life cycles, exploiting disturbed habitats in open or understorey. Dormancy is an early state.
INTEGRATION OF ACTIVE COMPOUNDS

Protectants
Nutrients
Symbionts
Soil adjuvant
Phytoactive promoters
Colours and tracers

+Storage
+ Germination
+ Production
- treatment
- cost
- environmental impact

FOLIAR, SOIL TREATMENT
APPLICATION
100%

IN FURROW TREATMENT
APPLICATION
5%

SEED TREATMENT
APPLICATION
0.5%

FIS. 1999. Seed treatment, a tool for sustainable agriculture. Nyon CH.
Does seed dormancy reflect an evolutionary path? 95% species endemism!

Austrobaileyaceae
Atherospermaceae
Blandfordiaceae - *post-fire*
Boryaceae - *Pd*
Doryanthaceae - *non-dorm*.
Xanthorrhoeaceae - *non-dorm*
Dasypogonaceae - *deep*
Anarthriaceae - *deep; aged*

*Borya sphaerocephala*
Fresh - stimulated by smoke, GA.
After 9 months - deep secondary dormancy

*Borya sphaerocephala*

*Xanthorrhoea preissii*

*Calectasia naragarra*

*Anarthria prolifera*
Ecdeiocoleaceae - after-ripening deep, aged.

Tetracarpaeaceae ???

Cephalotaceae - 2005!

Tremandraceae - $Pd$ (nick,GA)

Akaniaaceae ????

Emblinginaceae - 2005!

Gyrostemononaceae - $Pd$; aged, fire following

Eremosynaceae - ??? 2005! Fire following
We foster understanding and advancement of seed ecology, conservation, and seed-based restoration of degraded systems.

This network is a section of the Society of Ecological Restoration that would bring together professionals, scientists, practitioners, students, industry, government and organisations such as botanic gardens from the international community who have an interest in promoting and enhancing seed-based solutions in restoration.

*Prof. Kingsley Dixon*

**NEWS**

**INSR INAUGURAL BOARD OF DIRECTORS ANNOUNCED**

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**INSR CREATION HAS BEEN APPROVED BY SER BOARD**

[Read More →](#)

**AFR - AUTOMATED FOREST RESTORATION**

[Read More →](#)
Viability adjusted germination (%) of six weathering classes of *Leucopogon conostephioides*

![Graph showing germination opportunity for different weathering classes.](image-url)
Germination on demand still not possible
$99M on emergency fire rehabilitation projects in 10 years in Nevada

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Oat germination time lapse

Filmed by Neil Bromhall
www.rightplants-lmc.co.uk