

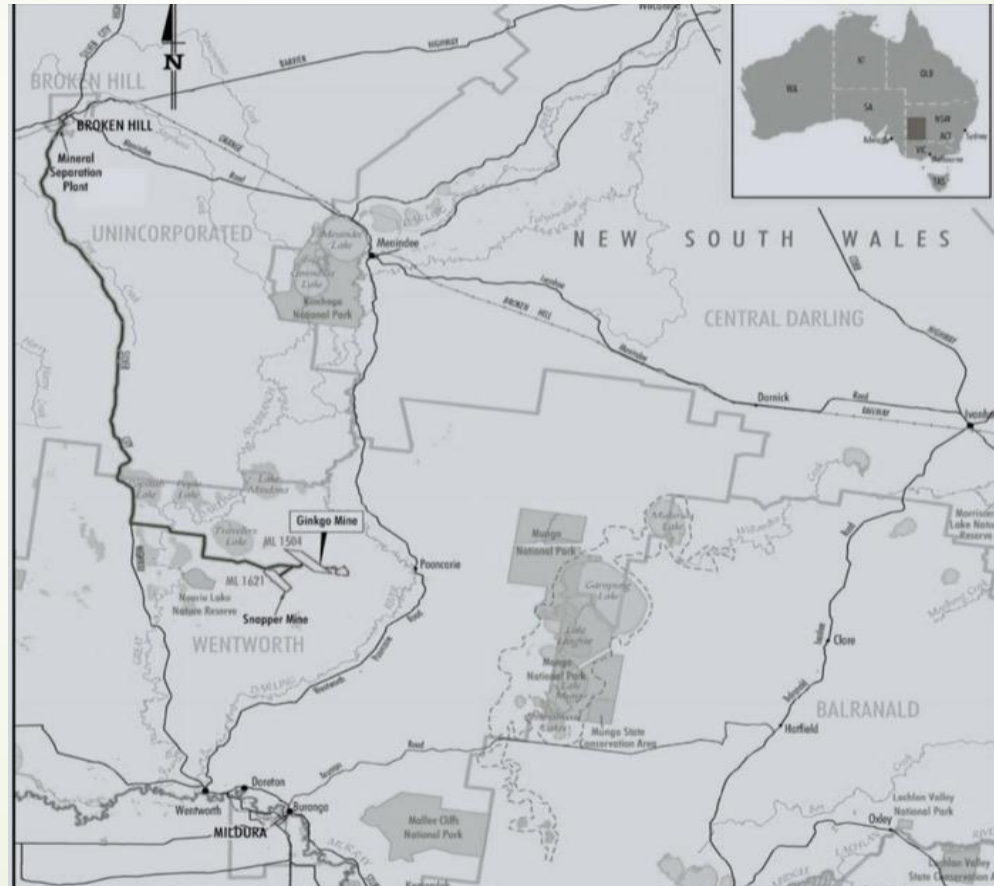


Setting the standard for arid land mine rehabilitation

Cristal Mining Australia: striving to set the standard for the rehabilitation of a Heavy Mineral Sands mining operation in Western NSW

Presented by Tim Zwiersen, Ecotypic Pty Ltd

Cristal Mining Australia- Murray Basin Operations- Snapper & Ginkgo Mines



Gingko Mine



Snapper Mine



Rehabilitation history





Rehabilitation Earthworks

- Removal and replacement of topsoil and a portion of subsoil using 'laser buckets' and articulated tractors
- Placement of stockpiled cleared timber onto batter slopes of landforms for stability and habitat
- Application of Gypsum

Highly erodible subsoil & overburden



GPS controlled 'laser buckets'



Timber mulch





Native seed procurement



- Wild harvest from adjacent pastoral leases
- Seed Production Area
- Onsite seed storage in insulated, air conditioned containers
- Flexible procurement- allows collection in bulk of species only available in good seasons
- Seed testing for viability, purity and germination before payment

Wild harvest



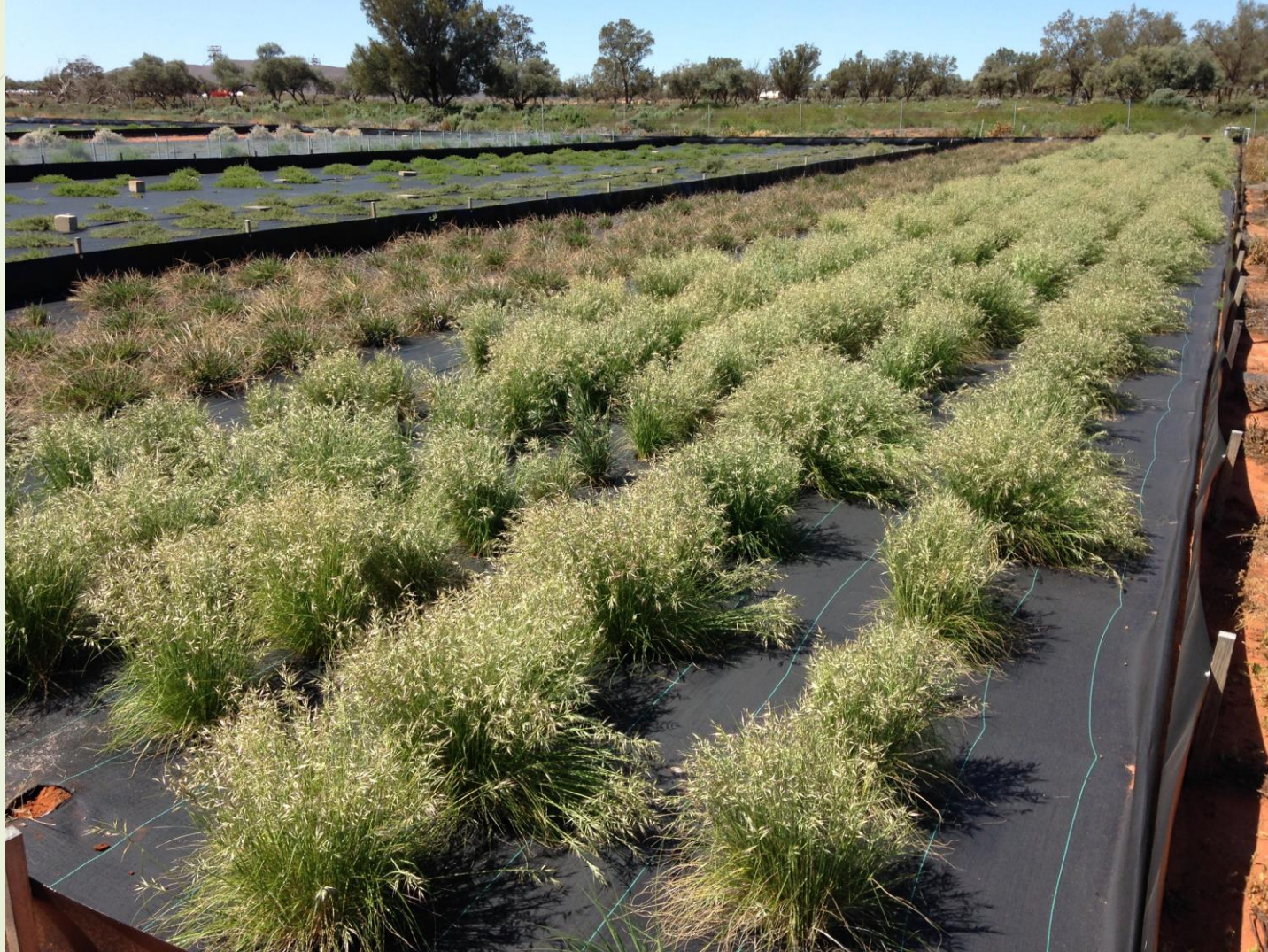
Wild harvest- low tech & high tech!



Wild harvest



Seed Production Area



SPA harvesting




Seed storage





Ongoing seed collection

- Set budget regardless of following seasons rehabilitation target
 - Build stocks of species only available in exceptional seasons (ie tree & shrub species)
 - Target is to maintain stock for two-three years of rehabilitation (species with short shelf life)
 - Up to ten years stock of long term storage species (ie hard coated trees & shrubs)
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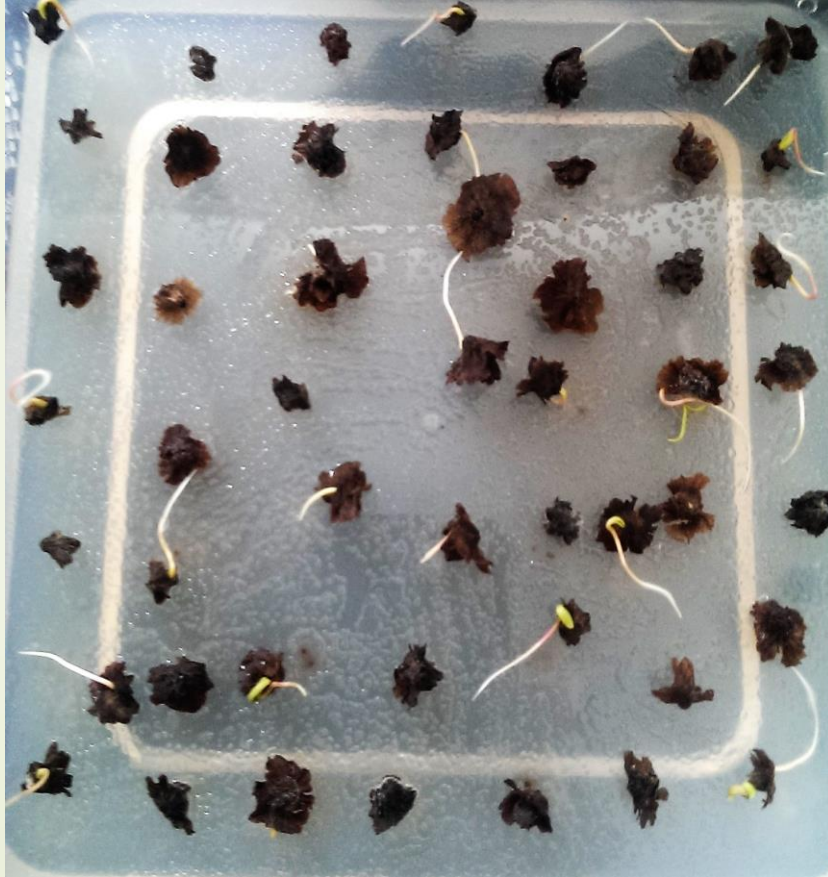


Seed Testing



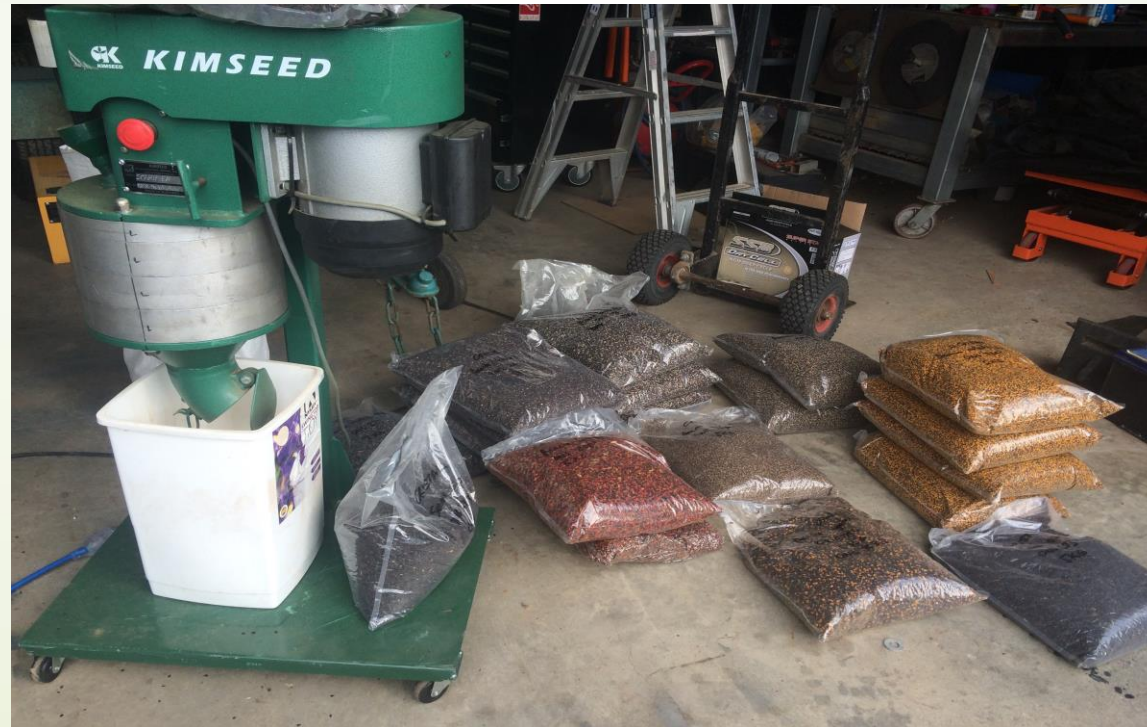
- ▶ Testing of all seed lots (over \$1k value) for viability (cut test) & purity
- ▶ Germination testing undertaken when new species are collected
- ▶ Service provided by Alice Quarmby, Swainsona Environmental Services

Seed testing



Seed Treatment

- Change from hot water treatment to mechanical scarification





Revegetation strategies



- Mechanical broadcast seeding
- Mechanical niche seeding of tree & shrub species
- Hand broadcast seeding of native grass seed
- Tube planting of canopy species

Mechanical broadcast seeding



Mechanical niche seeding



Tube stock revegetation



Tree guards...



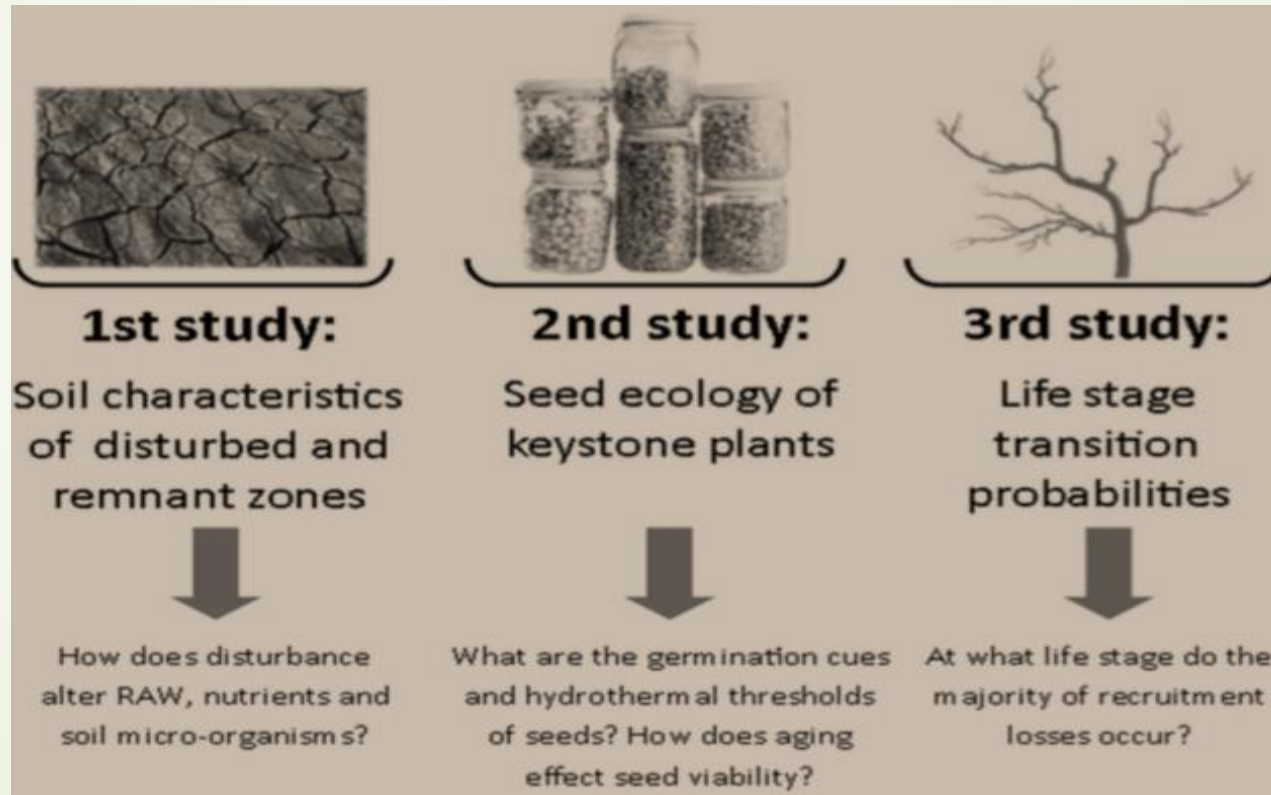


Research



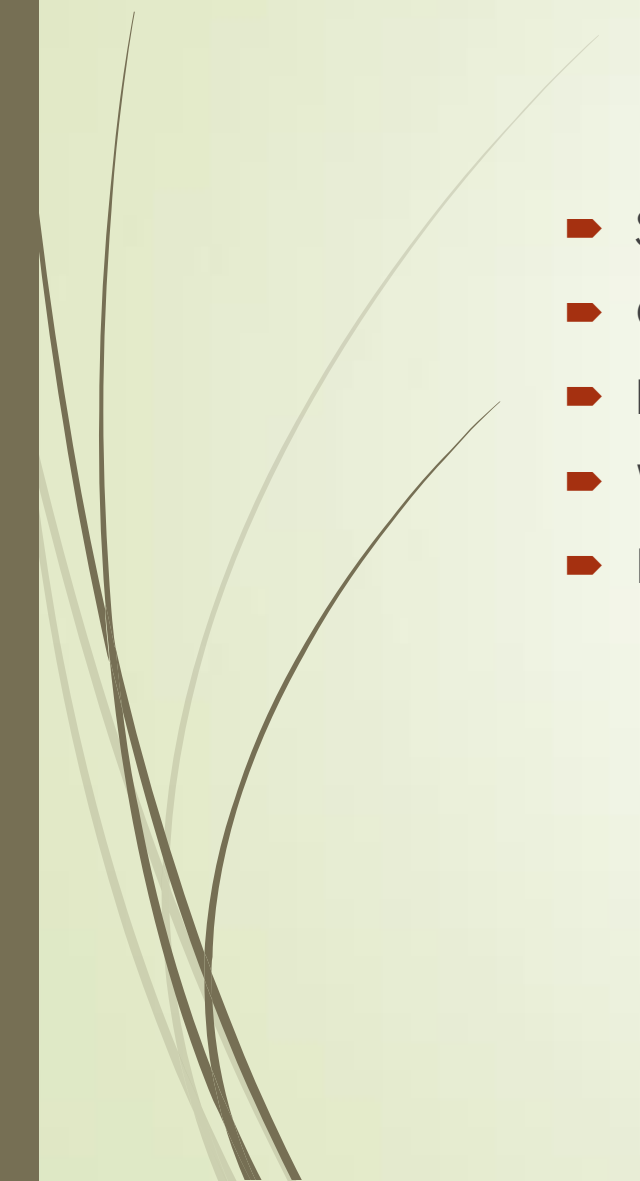
- Native Seed longevity project- key chenopod species
- Phd Project investigating “Barriers to restoration in disturbed, arid ecosystems”
- Topsoil seed bank study
- Bio-crust trials
- Pre Treatment trials- dormancy release for hard coated species

Corrine Duncan PhD Project: “Barriers to restoration in disturbed, arid ecosystems”

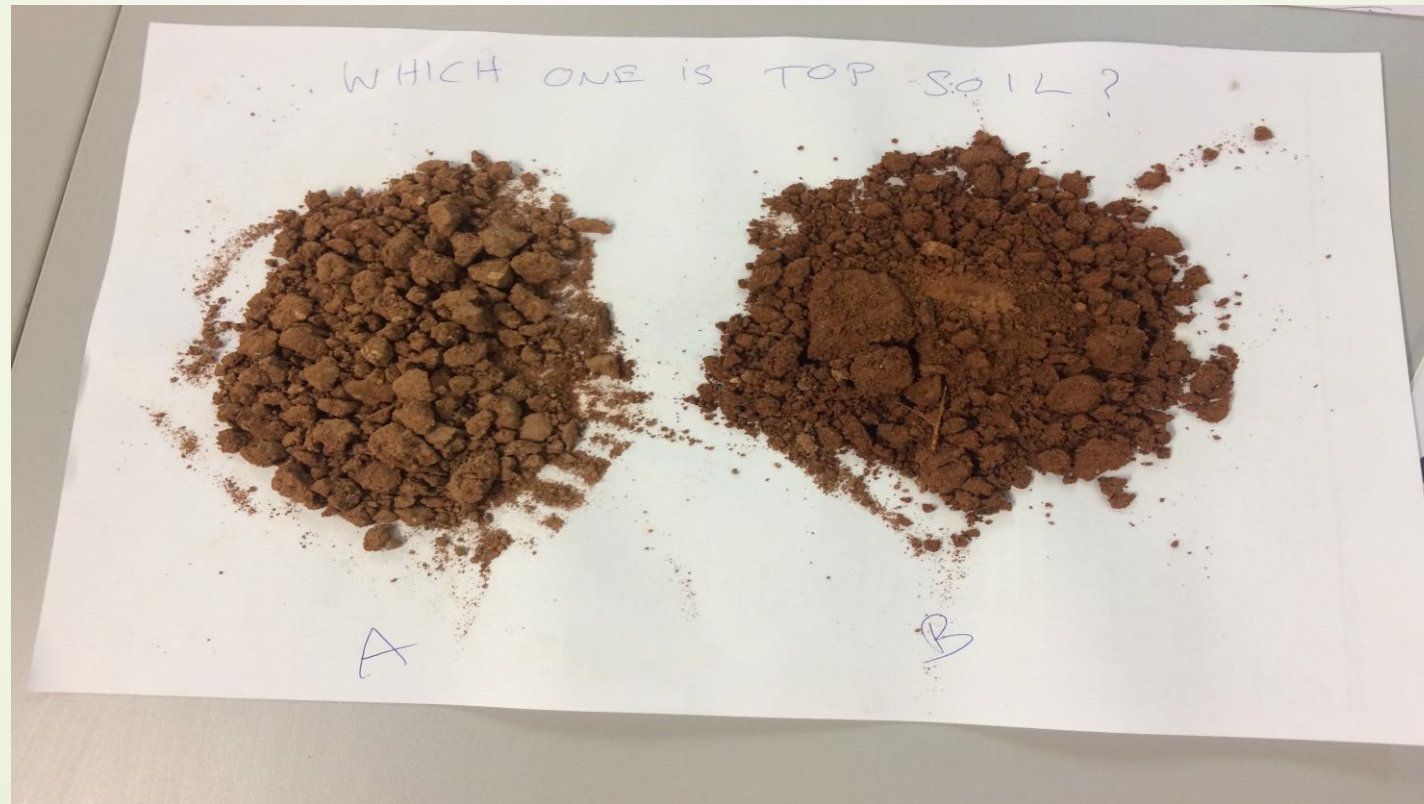




Challenges & Threatening Processes

- Soil conditions- compaction, structure and loss of organic components
 - Goat browsing
 - Insects- 'army worm'
 - Weeds
 - Rainfall
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Good soil, bad soil



Soil movement

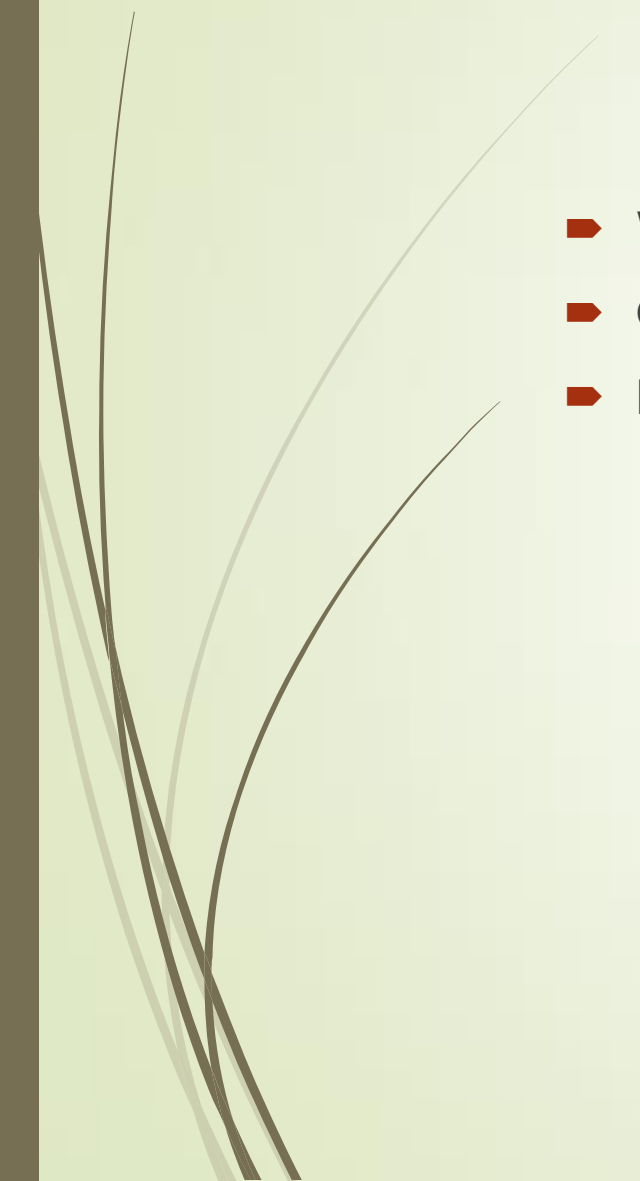


Pests- vertebrate & invertebrates





Other environmental initiatives

- Waste management- onsite landfill- biodegradable mess containers
 - Chooks for food scrap disposal
 - Drink container recycling
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Food scrap recycling!



Questions?

