Native Grass Seeding and Mulch Effects on Weedy Species:
a linkage between weeds and restoration

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Lake Tahoe, Microcosm
The Issues

- Water quality is dependant upon soil
- Plant growth is dependant upon soil
- Erosion control is dependant upon soil
- Weed growth is dependant upon soil
- What do we know about the soil?
Habitat restoration is difficult or impossible without stable soil.

Erosion control has been agricultural in approach for 25 years, little progress...
Asking the (soil) Questions

• What’s missing?  (disturbance)

• How to put it back... (restoration)

• What will grow?  (restoration)

• How do we stop the weeds?  (restoration)

• Do we ‘stop’ the weeds?  (ecological)
What's Missing?
The soil-plant ecosystem

Water
Plants
Decomposition
Uptake
Microbes
BYE!!
Mulch
What’s Missing?

Total N in Disturbed Tahoe Soils

Volcanic Soil N total
0-50 cm layer sum

Claassen and Hogan, 2002 Restoration Ecology
v.10,#2 pg 195-203
What’s Missing, the rest of the N story

Claassen and Hogan, 2002 Restoration Ecology v.10,#2 pg 195-203
Nitrogen Concepts

Total N (most organic)

Mineralizable N

Soluble N (NO₃⁻)

Net worth (earning power, investments, etc.)

Earnings/ROI

Pocket change
Replacing N: Soil Amendments

UC Davis Soils and Revegetation Sand Leaching Column Experiment

Claassen and Hogan, 1998 National Technical Information Service rept. # FHWA/CA/TL 98/18
Replacing N: Composts

Compost N Yield, 480 days

Nitrogen yield (percent of total N loaded) over a 480 day aerobic incubation of soils and amended soils (minus control substrate).

Carey, Jan; 2002, UC Davis Masters Thesis
Soil amendments, mulches, weeds...
Where is the Cheatgrass coming from??

- Compost
- Mulch
- Seed bank
- Blowing in?
Succession and competition

High N availability = high early seral weeds

(Bernese & Aerts, 1984; Heil & Bruggink 1987)
Initial Study Results

- **Treatments**
  - Compost + Biosol
  - Biosol
  - Mulch (no addt’l nutrients)

- **Results:**
Bromus tectorum response to compost mulch and nutrients

Percent Bromus tectorum in plot

sbpe 5  sbpe 6  sbpe 7

- Comp
- Biosol
- Control
Soil Restoration: Other Variables

- Compaction
  - Water
- Water holding capacity
  - Infiltration
  - Water
  - H₂O
- Microorganisms
- Other nutrients (macro and micro)
Other Variables

- **Competition**
  - **Native Grasses**
    - **Francis & Pyke 1996**
      - Wheatgrass (Norden, Hycrest)
      - 130-520 seeds m²
    - **Herron, Sheley, Maxwell & Jacobsen 2001**
      - Bluebunch, annual Rye, Squirreltail
      - 3000 seeds m²
    - **Northstar Unit 7**
      - 3000 seeds m²
      - < 1% Bromus tectorum
Other Variables II

- Soil Physical Treatment
Ecosystem Trajectories vs Weed Trajectories

Biomass and nutrient accumulation

Original Ecosystem

Replacement

Restoration

Rehabilitation

Original material or Degraded ecosystem

Species and complexity

Weeds

After Bradshaw and Chadwick, The Restoration of Land 1980
Weeds and Restoration: Where do we go from here?

• Testing
• Adaptive Management