

Management (Monitoring and Maintenance)

ESRM 302/CFR 590
Restoration Design

Elements of Site Management

- Performance standards for plants
- Hydrology
- Wildlife
- Invasives plan
- Herbivory
- System perturbations
- Routine maintenance
- Secondary planting
- Monitoring

Performance Standards for Plants

- Survival
- Healthy plants that grow
- Cover of natives
- Cover of invasives
- Responses:
 - Remove invasives
 - Replant
 - Select different species
 - Change locations of plantings

Hydrology

- Depth, frequency and duration of inundation
- Depth to groundwater
- Responses:
 - Change control of flooding if possible
 - Gates, valves, diversions, augmentation of flow
 - Create impoundments or depressions
 - Liners, channels, weirs
 - Replant at changed locations

Wildlife

- Either assess wildlife directly, or,
- Gauge the potential of the site to support wildlife.
- Monitor macro-invertebrates, amphibians, birds, mammals
- Responses:
 - Change vegetation structure
 - Modify microclimate or create microhabitats
 - Add species
 - Create wildlife features (snags, boxes)
 - Control predators
 - Create refugia (fences, islands, thick brush)

Invasive Species Management Plan

- Removal of invasives
- Control conditions
 - Minimize disturbance
 - Create shade
 - Quickly plant cleared areas
 - Create buffer zones
 - Control off-site areas
- Monitor reappearance of invasives
- Set response triggers for reaction

Invasive Species Management Plan

- Responses should be appropriate for species
 - Reed canarygrass: remove immediately and modify conditions
 - Canada thistle: cut seed heads, then herbicide entire clone
 - English ivy: cut down flowering stems; pull down from trees; schedule work events to roll up ivy mats and pile onto blue tarps

Herbivory

- Herbivory may start immediately
 - Geese
- Herbivory may start after a lag time, but proceed quickly
 - Beaver
- Defenses: fencing, tree tubes, mylar tape, chemical defenses, relocation, beaver deceivers

Herbivory

- Beaver: fence trees, install beaver deceiver
- Geese: fence installations around perimeter; use twine with mylar ribbons over top
- Crows: avoid shiny objects, put bird netting over newly planted sites or containers
- Voles: use tree shelters or pepper wax
- Deer: tall fencing or draped netting
- Mountain beaver: tree shelters, plastic mesh tubes

System Perturbations

- Periodically occurring and predictable
 - Seasonal precipitation patterns, temperatures, animal activities
- Infrequently or rarely occurring and hence unpredictable, but probable
 - Storm events, dike failure, changes in adjacent land uses
- Predictable disturbances should be incorporated in the design and operation

System Perturbations

- Preparations for periodically occurring and predictable perturbations
 - Dry periods: mulch, irrigation, Drywater™
 - Fires: plant in clumps
 - Winter storms: create surface obstructions, depressions, brush fences
 - Floods: plant high, use flood tolerant clonal plant species
 - Erosion: use bio-engineered installations (brush layering, fascines, gabions)

System Perturbations

- Infrequently or rarely occurring and hence unpredictable, but probable events
 - Choices:
 - 1 Go ahead, roll the dice, plant there.
 - 2 Hedge your bets. If part of the site is likely to be lost (avalanche hazard, fires, flood damage), invest some of your effort in nearby protected areas (behind outcrops, in tree clumps, on high ground).
 - 3 Put your effort somewhere else.

Routine Maintenance

- Maintaining anti-herbivory features; remain alert for introduction of new herbivores
- Mulching
- Maintenance of irrigation systems, and ultimately, removal
- Patching eroded channels
- Removing invasive plants
- Replanting
- Removal of tree shelters
- Keep interpretive materials in good condition and up to date

Secondary planting

- Replacement planting
- In-planting
- Sequential planting
 - Matrix or key species planted first
 - Less common or scattered species next
 - Special-condition species (e.g., shade-loving)
- Planting into conditioning plant assemblages
 - Western red cedar directly into willows
 - Oregon ash into created gaps

Monitoring

- Monitoring for sake of data collection will not help the monitored site
- Monitoring must be keyed to thresholds which will trigger actions
- Actions must be specific
 - e.g., “Remove if found.”
- Actions must be keyed to species
 - e.g., “Bullfrogs”