

RIPARIAN RESTORATION WORKSHOP TEMPLATE

Outline of Topic Content

Topic #1 Background on the scientific need for ecosystem restoration and biodiversity

- Ecological importance of riparian areas.
- Construction of large hydroelectric dams on rivers in the southwest: prevents annual flooding and “flushing” which removes salts from the soil, removes organic debris from riparian forests, recharges soil moisture, and creates the proper environment for germination and establishment of native vegetation.
- Tamarisk introduced intentionally. Well-adapted to survive and thrive in altered riparian systems:
 1. Adapted to higher salinity (mechanisms)
 2. Altered wildfire regimes (fast re-sprout)
 3. Lower moisture availability
 4. Prolific seed production
- Problems associated with non-native invasive species in riparian areas.
- Benefits of restoring native species:
 1. Streambank stabilization
 2. Biodiversity
 3. Ecological function
 4. Wildlife habitat
 5. Recreational opportunities
 6. Native seed stock for dispersal to areas downriver
- Composition and structure of diverse riparian plant communities, and their value as wildlife habitat.
- Release and spread of *Diorhabda* biological control, and implications for riparian habitats.

Topic #2 Overview of the Riparian Vegetation Restoration Process: 7 Step Process

(Adapted from: Anderson 1989; Anderson and Laymon 1989; Anderson, Russell, and Ohmart 2004)

1. Preliminary Analysis- Important step before investing time and money in a restoration project. Helps to determine appropriate species for revegetation.
 - Vegetation analysis: which plants occur in the area.
 - Soil Sampling at surface and just above the ground water table.
 - Soil texture, moisture, surface to water table depth, and EC:
 - Low salinity and medium to fine soil textures = favorable for germination and survival of revegetation.
 - High salinity = less water available for uptake by plant roots
 - Coarse textured soils = don't retain moisture as long after flooding/rainfall
2. Propagation (See Topic # 9)
3. Site Preparation
 - Control of Invasives- advantages of hand-clearing with herbicide stump treatment
 - Erosion after tamarisk removal- when bank stabilization/recontouring is appropriate

- Surface salts and compaction: When to consider treatment of surface soils
- 4. Irrigation System Design and Installation
 - Where and How Long? Needed where depth to ground water exceeds 3 feet, should continue 1-3 years or until roots reach water table.
 - Water source: Well? Stream/river channel? Tank?
 - Advantages of drip irrigation
 - Flood irrigation as another option- Yuma example
 - Materials: Pumps, mainline, lateral drip tube lines, screen filters, pressure-compensating emitters, ball shut-off valves
- 5. Planting (*See Topic #11*)
- 6. Irrigation and Weeding (Maintenance)
- 7. Monitoring and Reporting

Topic #3 Regulatory Compliance and Permitting

- The US Fish and Wildlife Service oversees compliance with the **National Environmental Policy Act (NEPA) of 1969**, and enforces the **Endangered Species Act (ESA)**, which requires a **Section 7** review/consultation.
 - Environmental Assessment (EA), public comment, and identifying issues and alternatives.
 - Categorical Exclusions
- US Army Corps of Engineers- charged with restoring and maintaining environmental quality under **Section 10 of River and Harbor Act of 1899** and **Section 404 of Clean Water Act**
- State DEQ Requirements. (Example: In conjunction with the US Army Corps of Engineers' Section 404 permit, the Arizona Department of Environmental Quality (ADEQ) must assess compliance with water quality standards, and issue a **Section 401 Water Quality Certification**.)
- Other State Requirements. (Example: Arizona State Historic Preservation Office (SHPO) administers the **National Historic Preservation Act (NHPA) of 1966**. Requires a **Section 106** Review to ensure historic properties are protected.)

Topic #4 Plant ID Crash Course- Recognizing key native and invasive plant species present in riparian areas in the region where restoration is planned.

Example:

(“Dominant Vegetation in the Project Area” listed in Grand Canyon Wildlands Council draft report “Colorado River Master Plan”, 2005)

- Grasses, sedges, rushes, cattails (Families Poaceae, Cyperaceae, Typhaceae)
 - brome grass species, *Bromus* spp.
 - phragmites, *Phragmites australis*
 - sedge species, *Carex* spp.
 - softstem bulrush, *Schoenoplectus tabernaemontani*
 - southern cattail, *Typha domingensis*
- Forbs
 - scarlet globe mallow, *Sphaeralcea coccinea*
 - Mojave seabligh (inkweed), *Suaeda moquinii* (*S. torreyana*)
 - princesplume, *Stanleya pinnata*
 - sacred thorn-apple (sacred datura), *Datura wrightii*

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- Shrubs and Trees
 - arrowweed, *Pluchea sericea*
 - common hoptree, *Ptelea trifoliata*
 - fourwing saltbush, *Atriplex canescens*
 - Fremont cottonwood, *Populus fremontii*
 - Goodding's willow, *Salix gooddingii*
 - Mexican cliffrose, *Purshia mexicana*
 - mormon tea, *Ephedra* spp.
 - mule-fat (seep willow), *Baccharis salicifolia*
 - narrowleaf willow (coyote willow), *Salix exigua*
 - netleaf hackberry, *Celtis laevigata* var. *reticulata*
 - princesplume, *Stanleya pinnata*
 - rabbitbrush, *Ericameria nauseosus* (*Chrysothamnus nauseosus*)
 - Russian olive, *Elaeagnus angustifolia*
 - salt cedar, *Tamarix* spp.
 - singleleaf ash, *Fraxinus anomala*
 - skunkbush sumac (squawbush), *Rhus trilobata*
 - Sonoran scrub oak / shrub live oak / turbinella oak, *Quercus turbinella*
 - stretchberry (desert olive), *Forestiera pubescens*
- Cacti
 - pricklypear cactus, *Opuntia* spp.

Topic #5 Herbicide (Garlon) Safety and Application – in the classroom, Day 1

Topic #6 Introduction to restoration site(s), past and present management, management challenges, and overview of what participants will be working on.

- Background on restoration sites.
 - Size, location, multiple uses
 - Invasive non-native and native species present
 - Water table(s), need for
 - Restoration potential

Topic #7 Chainsaw safety, Clearing woody biomass, and Demos

Topic #8 Demonstration of backcountry Garlon application

- Safety, PPE, and Material Safety Data Sheets (MSDS)
- Backcountry transportation and handling
- Mixing and calibration
- Effective application and common mistakes to avoid
- Clean-up and storage

Topic #9 Sustainable native seed and pole collection- Why, Where, When, & How

Importance of taking cuttings and seed from local genetic stock

- Collection and propagation tools and materials
- Cottonwood and willow cuttings: timing, preparation, and storage
- Care of seedlings and saplings pre-planting
- Potential re-veg species

Example:

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(Species used at Lees Ferry restoration project, 2002-04)

- Goodding's willow, *Salix gooddingii*
- narrowleaf willow (coyote willow), *Salix exigua*
- Fremont cottonwood, *Populus fremontii*
- fourwing saltbush, *Atriplex canescens*
- mule-fat (seep willow), *Baccharis salicifolia*
- Mojave seabligh (inkweed), *Suaeda moquinii* (*S. torreyana*)
- netleaf hackberry, *Celtis laevigata* var. *reticulata*
- stretchberry (desert olive), *Forestiera neomexicana*
- greasewood, *Sarcobatus vermiculatus*
- Apache plume, *Fallugia paradoxa*
- Sonoran scrub oak / shrub live oak / turbinella oak, *Quercus turbinella*
- skunkbush sumac (squawbush), *Rhus trilobata*
- singleleaf ash, *Fraxinus anomala*
- boxelder, *Acer negundo*

Topic #10 (on-site) Characteristics and restoration potential of specific workshop restoration sites.

- Location and topography
- Micro-habitats, moisture availability
- Size and condition of tamarisk, Russian olive, other invasives
- Restoration potential and native plants present on site
- Other details

Topic #11 Revegetation with hands-on demos

- Time of year
- Tools and materials
- Species we'll be using
- Fencing, cages, and tubing: Beaver, deer, burros, cattle, small mammals, sucking insects
- Factors to consider when determining planting locations and densities
- Planting techniques, how to plant willow, cottonwood, plugs and cuttings, etc.
- Irrigation: set-up, frequency, maintenance, duration
- How long until plantings are well established and self-sustaining? Factors to consider
- Upland revegetation for second and third terraces: broadcast seeding, drought-tolerant species

Topic #12 Leadership Skills, and Careers in the National Park Service

- Managing Work Crews and Volunteer Groups
 - Keeping crew members and volunteers motivated
 - Quality Control
 - Conflict Resolution
 - Safety

Topic #13 Tour of Local Restoration Site- Survivorship, Mortality, What Worked, What Didn't, and Why