Monitoring WRV Projects – What We Learned During 2015
September 28, 2015
Laura Backus, Alan Carpenter, Todd Sanford

Background and Purpose

Laura and Alan decided to resurrect the monitoring initiative that began several years ago. We believe that formal, but not necessarily complicated, monitoring is essential to learn from our project successes and failures and to incorporate those lessons into future projects. We also believe that our supporters will increasingly demand to see evidence that our projects are effective.

We met with a small group of interested persons (Laura Backus, Alan Carpenter, Paul Lipscomb, Camille Thorsen, Gwen Kittel, Tim Seastedt, Melissa Daniels, Tracy Halward) on June 22, 2015 to discuss the way forward, in particular deciding what we were trying to accomplish.

The group decided to conduct a non-random sample of several monitoring projects to:
1) Determine if we could develop a flexible field form that would facilitate volunteers conducting monitoring visits, and
2) Highlight key lessons learned.

We and other volunteers monitored a total of 10 WRV projects: Berthoud Pass 2008; Betasso Social Trail Restoration 2007; Boulder Creek Adopt a site 2010, 2012; Brainard Lake Portal 2012; Broomfield Wetland 2013; Broomfield Field Open Space 2014; Chico Basin Riparian Restoration 2015; Coot Pond 2007; Eldorado Canyon Flood Repair 2 2014; Left Hand Creek Russian-olive Removal 2005, 2008. The monitoring reports for nine of these projects are attached; the report for Chico Basin is not yet finished. Some of the monitoring visits used a field form that Laura developed, other visits did not but the monitoring reports were formatted using the form.

None of these monitoring reports are intended to serve as "required" monitoring either by the project sponsor or by a donor.

What We Learned

Volunteers can monitor WRV projects and provide useful evaluations with a modest expenditure of time and effort as well as with minimal staff assistance. Highly experienced volunteers are more than willing to do monitoring.

We extracted key lessons from the monitoring, including the following:
1) At high elevations creating micro habitats helped jump-start establishment and growth of seeded species and volunteer species
2) The TA should be on-site when client crews are drilling planting holes
3) Protect the lower 2 feet of all new cottonwoods from small rodent gnawing by installing mesh caging or painting the stem with a mixture of paint and sand.
4) Pre-2013 flood removal of Russian-olive continues to have long-term benefit
5) Don't install plants in obvious and accessible areas of high visitor use
6) Differences in crew leader and TA skill on project day can be discernable even after seven years.

For some projects, monitoring is impeded due to the lack of pre-project notes and photographs as well as post-project information. We suggest that the TA on each project should be tasked with providing "as built" information, perhaps by editing the crew leader technical notes and/or section notes or preparing an addendum to the notes.

The field form worked well. Laura made small modifications in response to feedback she received from the volunteer project monitors. A copy of the form is attached.

Recommendations

Develop a rational and practical approach to select past and future projects for monitoring.

Create a folder of pre-project notes and post-project as-built information in the WRV data base that the monitors can access without further staff assistance.

Identify a cadre of volunteers who would like to monitor projects.

Continue the monitoring next summer using the field form.

Summarize and present the results of next summer's monitoring to the WRV board.

WRV QUICK MONITOR D R A F T

Project Name: Berthoud Pass Restoration
Location: Berthoud Pass, west side
Project date(s): August 23-24, 2008 **Monitoring Dates**: August 22, 2015, September 2, 2015
Monitor(s): Laura Backus, Brett Pirie

Project goal(s): Revegetate old roads, open pit area, and weather station to restore alpine and subalpine habitat on and near a former ski area on the west side of Berthoud Pass at elevations up to 12,000 feet. Note this monitoring does not include the tree planting on the west side ski slope.

Techniques used and their effectiveness:
The most effective techniques are in bold.
Note that many techniques were difficult to evaluate due to passage of seven years and growth of many plants which appeared to be volunteers.
Activities at most sections included:

- Soil scarification - unclear, but known to be a good practice
- **Digging of planting depressions and installing *Vaccinium* and spruce/fir transplants** - effective in more level sections, especially for *Vaccinium* which appeared to have at least 25% survival in these areas, but did not appear to be effective in steeper sections.
- Seeding of native grasses - at least somewhat effective. Although overall grass cover is very sparse, in most sections we noticed small clumps of seeded grasses (apparently *Poa alpina*, *Festuca saximontana* probably, *Trisetum spicatum*, *Deschampsia caespitosa*).
- **Placement of large rocks, duff and/or woody debris** - effective. Providing growing habitat for seeded and volunteer plants appeared to be overall effective. Probably due to increased water sequestration and wind protection, the areas beneath large woody debris and immediately adjacent to large rocks had noticeably more plants developing than the open areas. Many of these plants appeared to be volunteers.

Some sections also included:

- Biosol treatment - did not determine
- **Check dams** - very effective - little to no indication of active erosion
- **Water bars** - very effective - little to no indication of active erosion
- Erosion mats - unclear - in some areas it appeared that the remnant matting was inhibiting colonization by volunteer species. Note that mats degrade very slowly at this elevation.
- Removal of trash - always a good idea

General observations (e.g., weediness, erosion):
No weeds or significant erosion observed.

Did the project meet the goals?
Revegetation is on track and slowly progressing.

Did the project cause any untended consequences?
Areas of un-degraded erosion matting appeared to have very few volunteer plants.

Corrective or Maintenance activities needed:
None observed

Other pertinent information (flood, fire, construction, wildlife observations):
None observed

- **Important lessons for future WRV projects:**
- Areas where seeding worked best were adjacent to or among large rocks, planting depressions, around woody debris. There appeared to be a clustering of our seeded grasses plus volunteers, including willows and spruce, around the large woody debris and large rocks.
- Very few transplants survived on steeper sections; in these areas, creation of favorable microhabitats with rocks, large woody debris, and planting depressions and grass seeding could be more effective. We also recommend concentrating seeding in these areas.
- Transplant survival appeared to be up to 25% on more level sections. *Vaccinium* transplants had vigorous survivors as did some willow transplants. It is likely that the adjacent upland willow stands provided an important seed source to revegetation of the old road bed. Seeding of willows could be effective.
- The grass seed mix appeared to work well.
- Be prepared to have a portion of closed roads become foot trails. Although people were walking along the sides of the project area roads, no significant damage was observed to plantings. We did, however, note that some rocks from a water bar had been re-purposed into a fire pit!
- On project day or during project debrief, document all changes from the Crew Leader Notes. For example, at the weather station area, we noted 5 small planting areas marked off with stone. Possibly each area received a different treatment, but there is no record.
- Planting depressions for transplants were effective for transplant survival in the more level areas and possibly as microhabitats for volunteer species in the steeper areas.
- In some areas, the erosion mats appeared to have inhibited plant development, especially of volunteers. In many areas of matting, the organic portion of the mat had not fully disintegrated and the synthetic portion was still visible. Only use fully biodegradable mats.
- Work with Crew Leaders to do quality control on all project steps and with Technical Advisors to spot check the progress of all crews. For example, although treatments were identical, there was a marked difference in grass cover between 2 of the lower sections.
- Project monitoring is incomplete; we only monitored the area we were familiar with.

Photographs on following pages

Berthoud Pass

Road to West of Open Pit Area, view to west

2008 pre-project

2015 monitoring. Note increase in vegetation cover.

View up hill toward Top of west-facing road, approximately Station 2 or 3, weather station tower in background

2008 pre-project

2015 monitoring. Note increase in vegetation cover, especially adjacent to woody debris and boulders.

West-facing road, view to east, approximately Station 6 or 7

2008 pre-project, view to east

2008 project implementation, view to east

2015 monitoring, view to east (down slope).
Note increase in number of small clumps of vegetation.

2015 monitoring, view to west (up slope).
Note increase in grass clumps.

Weather Station	
 2008 pre-project, view to south	 2015 monitoring, view to south. Note small increase in vegetation cover.
 2008 pre-project, view to north	 2015 monitoring, view to northwest. Experimental seeding site. Note that erosion control mat has not disintegrated.

2015 Notes

Woody debris and large boulders provide valuable micro-habitat for seeded and volunteer species.

Planting depressions provide valuable habitat for transplants and volunteer species.

WRV QUICK MONITOR

Field supplies: form, project crew leader notes, team debrief notes and As Built information, pre-project photos or post-project photos, project aerial map or site drawing, Google Earth pre-project and current aerials, pencils, markers, GPS, compass, field guides, collecting bags, camera,

Project Name: Betasso Trail Restoration
Location: Betasso Preserve, Boulder County
Project date(s): Oct 2007 **Monitoring Date**: Aug 26 and Sept 2, 2015
Monitor(s): Gwen Kittel and Tim Kittel

Project goal(s): Obscure 4,733 feet of social trails, build new planned trails.

Techniques used and their effectiveness: Scarifying the Social Trail Tread; outsloping trail tread; seeding and racking; scattering large debris; water bars; All of these techniques appeared to work, all of them together really made that trail disappear. Only someone with a map looking for the trail would be able to find it, and in many places we could not discern it from animal trails. Building the new trails gave somewhere else for people to go, so it appears no one is using the old social trails, which also helps them disappear over time. Given that these trails were worked on before the 2013 floods, and the high rains in 2015, these trails are in great shape.

General observations of weediness, plant survival, erosion: I managed to find and walk all of sections C, B, A, E and the lower part of F.
Section C where it starts from the existing Canyon Loop train is very well vegetated and you really cannot see the trail, I did find the old social trail there, but only because I was looking for it. Section C has large woody debris and pine cones along its length, it is not well vegetated except at the southern end, but is very obscure and difficult to see.
Section B is less well obliterated, it has a lot of woody debris, and looks more like a deer trail than human trail but is easily observed. Along its length, it's easy to lose the trail and parts are more obscure than others. Section A is also well vegetated and obscure, but I could follow it like a deer trail, the steep section dropping down into 4-mile canyon is very heavily covered in grasses and pine cones. Section E was more well vegetated then other sections presumable due to the north facing aspect of the trail, and where not vegetated is was covered in wood debris and pine cones and overall was the most difficult section to follow, even with the map. Only the area where E, A and B converged was the old trail obvious, that is a remote location, and not where the public would be looking. Section F, the lower most section, the part from its junction with E to the new trail, was so obscure my husband and I could not detect it at all and were in disagreement as to which deer trail is likely was! Above (meaning up hill) from the new trail, we could see the old social trail, but light was failing and it was time to head for home, so we did not hike up the hill and monitor that last section.

Did the project meet the goals? Yes the social trails are very well obscured and are disappearing. The new trail is very well used, and seems to have stopped all use of the social trails.

Did the project cause any untended consequences? None that I observed.

Corrective or Maintenance activities needed: None

Other pertinent information (flood, fire, construction, wildlife observations): Deer and other animals make their own trails and may be using the old social trails as well. There was heavy rain fall in the area fall 2013 and heavy wet late snows and lots of rain in 2015, but the trails and the restoration is holding up very well.

Important lessons for future WRV projects: The combination of all techniques together really was effective in obscuring the old social trail. I don't think any of those techniques by themselves would have worked as well given the variety of aspect, and slope steepness of the social trails.

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions.

Start of Section C off of Canyon Loop Trail, looking north.

Section C us really hard to see. View is looking south, toward Canyon Loop Trail, about half way to the Loop Link Trail.

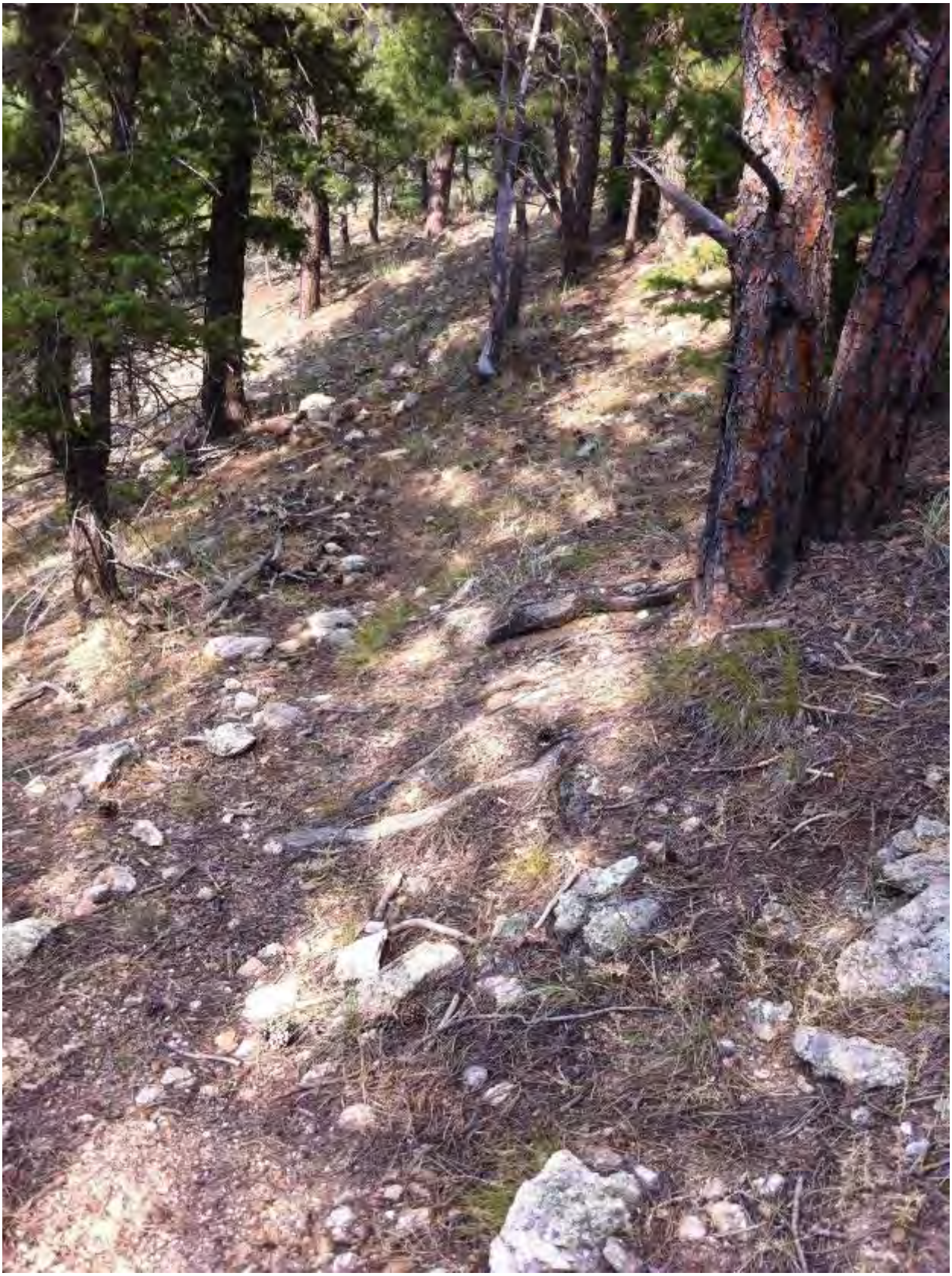
Section B is more obvious from Loop Link trail, but it appears un-used by humans

Water bar on Section B holding well.

Grass seeding may not have worked, but trail is still quite obscure...

Section B. Woody Debris is working well to obscure the trail

Section B very well obscured.



Section A was a little easier to follow as it is pretty steep in sections.

Section A is there, but not terribly obvious

Section A, nicely obscure.

Water bar along Section A, which is holding well.

Steep but relatively obscure trail (Section A).

Very steep section of Section A, with water bars holding very well, trail has lots of sediment deposition on top of it.

Section A, lower most section near 4-mile canyon access point, is very well vegetated, and totally obscure.

Well vegetated part of the lower part of Section A.

Very well vegetated lower section of Section A.

Section A at 4 mile canyon, very well obscured, and can't really tell where the trail used to go for the most part.

Junction of Social Trail sections A, B and E, not very obvious. Looking west.

Section E, east end, nicely obscured by woody debris.

Section E. East end, Oregon grape growing right out of the old trail

Section E, east end, approaching creek, very well vegetated.

Section E, approaching creek at east end, Oregon grape growing right out of the trail.

Section E, right alongside of creek, so well vegetated and covered in debris we didn't notice it at all. Woody debris placed well, and naturally.

Section E, very nice water bar made with a combination rock and log, holding well, allowing vegetation to build up on the uphill side.

Nice vegetation along Section E, alongside Creek, about the middle part of E.

Section D very well obscured by litter.

Section D very well obscured by rocks and woody debris.

Section D, nicely obscured by well bars and rocks and woody debris.

Section D looking more like a deer trail than a social trail, again woody debris and scattered rocks are working well.

Section F, steep section between creek and new trail, well obliterated by rocks and debris.

Am I on the trail? Not sure! (Section F)

Section F, maybe this was part of the water bar?

Section F above new trails, well vegetated, difficult to see old social trail.

Section F, above new trails, very well vegetated.

Section F, above new trail, looking West, you can find it, but it's pretty well vegetated.

Section F, above (up hill and west of new trail) well obscured by woody debris and vegetation.

WRV QUICK MONITOR

Field supplies: form, project crew leader notes, team debrief notes and As Built information, pre-project photos or post-project photos, project aerial map or site drawing, Google Earth pre-project and current aerials, pencils, markers, GPS, compass, field guides, collecting bags, camera,

Project Name: Boulder Creek
Location: 55th and Valmont
Project date(s): Oct 2010, June 2012 **Monitoring Date**: Aug 21st 2015 (3 years later)
Monitor(s): Gwen Kittel and Jennifer Sommer

Project goal(s): Transform Boulder creek into a thriving native riparian community

Techniques used and their effectiveness: Removal of non-native trees and non-native biennial weeds, plant native trees, shrubs, and herbaceous plants.

General observations of weediness, plant survival, erosion: in late August the weeds were tall and abundant, obscuring the native shrubs. Away from the bike path trail (north) the weediness reduced.

Did the project meet the goals? Area is complete re-vegetated with many healthy native plants. In areas 1, 2, and 4 we did see many snowberry and chokecherry bushes that were about 2-3 feet in height. A few currents were still on site, but the plums were not to be founds, nor the rose. All of the cottonwood and peach-leaf willows survived and are spreading. However the abundance and height of the herbaceous weeds were obscuring the few of low woody plants, so there may have been more we just could not observe. In areas 5 and 6 we saw many more low native shrubs, so there is a higher rate of success there. Overall there were many peach-leaf willow trees and many cottonwood trees, both young and sprouts. The flooding in 2013 may have drowned the native shrub plantings in areas 1, 2, 3, 4, 7, 8, and 9.
I did observe many native herbaceous plants throughout the site, although from the notes, WRV only planted herbaceous species in one central area in 2012. I observed many patches of clustered field sedge, woolly sedge, spike rush, prairie cordgrass, switchgrass, and inland saltgrass. Also in this central area that was wetter, possibly pooled water for a time, as there are many cattails and bull rushes growing there. I also observed 2-3 patches of *Phalaris arundinacea* (reed canarygrass), presumably the native variety.

Did the project cause any untended consequences? None that I could see.

Corrective or Maintenance activities needed: There are some invited guests: several Box elder and green ash trees, in the form of tiny sprouts, and probably about a dozen young trees of both species that are about 5 feet tall. Abundant non-native weeds such as white clover, bull thistle, Canada thistle, teasel, mullen, and burdock. There is also one patch of *Phragmites australis* (common reed) the introduced non-native noxious weed.

Other pertinent information (flood, fire, construction, wildlife observations): I observed a downy woodpecker pecking away on the stem of a teasel plant and on a mullen. Many butterflies attending late summer flowers. There are a number of large dead trees, I don't think these were planted but a product of the flooding perhaps. Most of them are fairly large. A few may have been smaller

Important lessons for future WRV projects: Good project notes about what species where planted where, makes for specific monitoring. However I don't know which plants were bare-root stems vs pots vs seeding, so can't say success by technique.

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions.

2010 Boulder Creek Tree Removal

Area 1-- Tall weeds, teasel, white clover, many native and non-native grasses.

Area 1 Snowberry plants

Area 1 Downy woodpecker

Area 1 weeds

Area 2 weedy

Areas 5 surviving chokecherry shrubs

2010 Tree Removal, area 5

Area 5, surviving chokecherry shrubs 2015

Area 6 Choke cherry and Virginia creeper

Area 3 Snowberry

Area between 8 and 9, cattails, young peach-leaf willows

Areas between 8 and 9, flood debris, cattails

Area between 8 and 9, Lots of native graminoid growth

Clustered field sedge (*Carex praegracilis*)

Area 7, Weeds and young cottonwoods

Many cottonwood sprouts

WRV QUICK MONITOR

Field supplies: form, project crew leader notes, team debrief notes and As Built information, pre-project photos or post-project photos, project aerial map or site drawing, Google Earth pre-project and current aerials, pencils, markers, GPS, compass, field guides, collecting bags, camera,

Project Name: Brainard Lake Portal
Location: Brainard Lake Portal Parking Lot area
Project date(s): Sept 1-2, 2012 **Monitoring Date**: August 4 2015
Monitor(s): Alan Carpenter

Project goal(s):

1) Greatly improve the visual attractiveness of Brainard Portal area.
2) Create a trail connection to the Sourdough Trail.
3) Close and revegetate numerous social trails and campsites near the Portal parking lot.
4) Greatly increase the vegetation cover on the steep slope adjacent to the Portal entrance station.

Techniques used and their effectiveness:

1a) Seeded and, in selected spots, installed erosion mat to increase native grass and forb vegetation cover on areas seeded in 2011 after the parking lot was constructed.

The area around the parking lot and the adjacent buildings is visually attractive. Vegetation cover consists mostly of native grasses with numerous forbs. Lupine and yarrow, both of which were seeded, appeared to be the most abundant forbs. Numerous forb species established from seeds in the seed bank. Somewhat surprising to me was the absence of fireweed, which was seeded. Slender wheatgrass (included in the seed mix) is the most abundant plant in the seeded areas; seeded big bluegrass, alpine bluegrass, and Rocky Mountain fescue were fairly common. I was surprised to see virtually no mountain brome, which was seeded. Overall, plant species diversity was good. Non-native plants were generally sparse, including cheatgrass, smooth brome, and Canada thistle. Some minor follow-up weed control is needed to eliminate two Canada thistle plants before they spread. I observed no signs of significant soil erosion.

1b) Planted native trees and shrubs around the parking lot, especially near the bathroom and warming building.

A high proportion of the tree seedlings planted near the bathroom and warming building survived, and the trees are vigorous. Small spruce trees appear to have been transplanted around the south side of the parking lot this year. These tree seedlings were planted too close together for the trees to assume their full form, assuming that most of the transplants survive.

2) Constructed 470 feet of new trail starting at the western edge of the parking lot, connecting to the Sourdough Trail.

The trail was well-designed and well-constructed and is attractive. It is well used by the public. Compliance with staying on the trail appears to be excellent. I observed no evidence of erosion on or along the trail. The bridge is in good condition.

3)Closed and disguised up to 1200 feet of social trails and campsites north of the parking lot and an old roadbed south of the parking lot.

The social trails and camp sites appear to have been abandoned by the public. The myriad of tree limbs planed on the social trail originating on the north side of the parking near the bathroom has effectively steered visitors from the social trail to the constructed trail. Native plants are slowly colonizing the social trails and the camp sites. It appeared that the social trails and camp sites were not seeded – few seeded grasses were growing on the social trails and camp sites. If the social trails were not seeded, they should have been. If they were seeded, the seeding was ineffective. I observed little evidence that the former camp sites are still being used.

4) Seeded and applied Wood Straw on a steep slope immediately south of the Brainard Lake entrance fee station along the main entrance road, about ¼ mile west of the parking lot; install willow poles at the base of the slope.

Vegetation cover on the steep slope was variable depending on the steepness of the slope. The top and bottom of the slope were generally well vegetated with seeded grasses and forbs. However, the steeper middle potion of the slope still had spots that were fairly bare of vegetation. The crew leader and section notes for this area called for erosion mat to be installed, but I did not find any evidence of erosion mat; rather observed old Wood Straw. It appears that Wood Straw was substituted for erosion mat in this work area. The Wood Straw was not effective on the steeper portions of the slope, where erosion mat should have been applied. The survival of the willow stakes installed in the drainage at the bottom of the slope appears to be satisfactory. The willows are still small, but looked to be healthy. I expect that the willows will increase greatly in size over the next few years. I observed minimal erosion along the bottom of the drainage at the bottom of the slope.

General observations of weediness, plant survival, erosion: Minor cover of non-native plant species. If the social trails were seeded, the recruitment of seeded species was poor. Erosion appears to have been minimal.

Did the project meet the goals? Yes, with a few exceptions as noted above.

Did the project cause any untended consequences? Not that I observed.

Corrective or Maintenance activities needed: Eliminate the small occurrence of Canada thistle near the Portal parking lot.

Other pertinent information (flood, fire, construction, wildlife observations): None

Important lessons for future WRV projects:

Including forb seeds in the seed mix greatly contributed to the current plant diversity and visual attractiveness of the vegetation. The likelihood of noxious weeds overwhelming the seeded plant species was remote at this elevation. Thus, we had no concern when creating the seed mix for the project that follow-up weed control, that might have adversely impacted the seeded and volunteer forbs, would be a significant issue

Wood Straw was ineffective on the steepest part of the slope (over 45% slope) at the entrance station.

The social trails and camp sites should have been seeded if they weren't seeded. If they were seeded, the seeding was ineffective.

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions

Looking west at the bathroom and warming house

Looking west at the revegetated area between the parking lots, the warming hut is in the background

Looking south at a former social trail about 200 feet northeast of the bathroom, lots of branches, the trail was successfully closed, but revegetation is spotty

Looking west at the steep slope immediately south of the Brainard Portal entrance station, revegetation of the steep of the middle slope was spotty, Wood Straw was ineffective, erosion mat would have been a better choice

WRV QUICK MONITOR

Field supplies: form, project crew leader notes, team debrief notes and As Built information, pre-project photos or post-project photos, project aerial map or site drawing, Google Earth pre-project and current aerials, pencils, markers, GPS, compass, field guides, collecting bags, camera,

Project Name: Broomfield Wetland Restoration
Location: Broomfield Commons OS and Plaster OS
Project date(s): May 17, 2013 **Monitoring Date**: September 11, 2015
Monitor(s): Melissa Daniels and Tracy Halward

Project goal(s): Restoration of two wetland areas

Techniques used and their effectiveness:
Harvesting and planting willow poles – Around 40 successful willows were found in at least one place (marked in yellow polygon on Map 2 below photos) in Plaster OS. In another area of Plaster OS (Eastern restoration area, red polygon on the left of Map 2), there are lots of big willows and small willows, but not sure which small willows were planted by WRV and which are there naturally (See Photos #12-14). Two willows were found in Commons OS (Photo #6).
Cottonwood poles – Three small cottonwoods found in Commons OS (Photos #1,2). At least one cottonwood found at Plaster OS.
Buffalo berry and rabbitbrush in containers – None found at either site.

General observations of weediness, plant survival, erosion:
LOTS of weeds, especially in Commons OS where there are plenty of weeds and grasses and very few trees and shrubs. Weeds found frequently in both places: sow thistle, Canada thistle, horseweed.
Minimal plant survival in Commons OS. We initially attributed it to flooding since the project was done 4 months before the flood. I called Broomfield Parks, who told me that flood damage in the Commons OS was minimal, but even without extreme flood damage, the increased rainfall could have killed the plants.

Did the project meet the goals?
At Commons OS – no. Very, very few trees and shrubs were found.
At Plaster OS – kind of yes. It looks like they planted: 50 cottonwood poles, 230 willows poles, 10 buffalo berry, and 10 rabbitbrush. We did not find any rabbitbrush or buffalo berry, but it is possible these were hidden and we could not see them. Very few cottonwoods were found, and at least 40 willows were found.

Did the project cause any untended consequences?
No

Corrective or Maintenance activities needed:
Unsure

Other pertinent information (flood, fire, construction, wildlife observations):
Broomfield Parks Dept says flooding in that area was minimal, but cannot get reliable information.

Important lessons for future WRV projects:
As two people who were not at the project and had never been to the site before, it was a little

bit difficult to know what to look for in the different areas. In an ideal world where time and money were not a problem, it would be helpful to note on a map in what general areas each plant type was planted, especially for species like the buffalo berry and rabbitbrush where few were planted.

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions

Photos #1-6 = Broomfield Commons OS
Photos #7-14 = Plaster OS

Note: GPS points were determined using an iPhone app, not a GPS unit, and therefore are not 100% accurate.

Photo #1: 39° 55’ 52” N, 105° 02’ 21” W. Compass bearing: 334°

Photo #2: 39° 55’ 52” N, 105° 02’ 21” W. Compass bearing: 42°

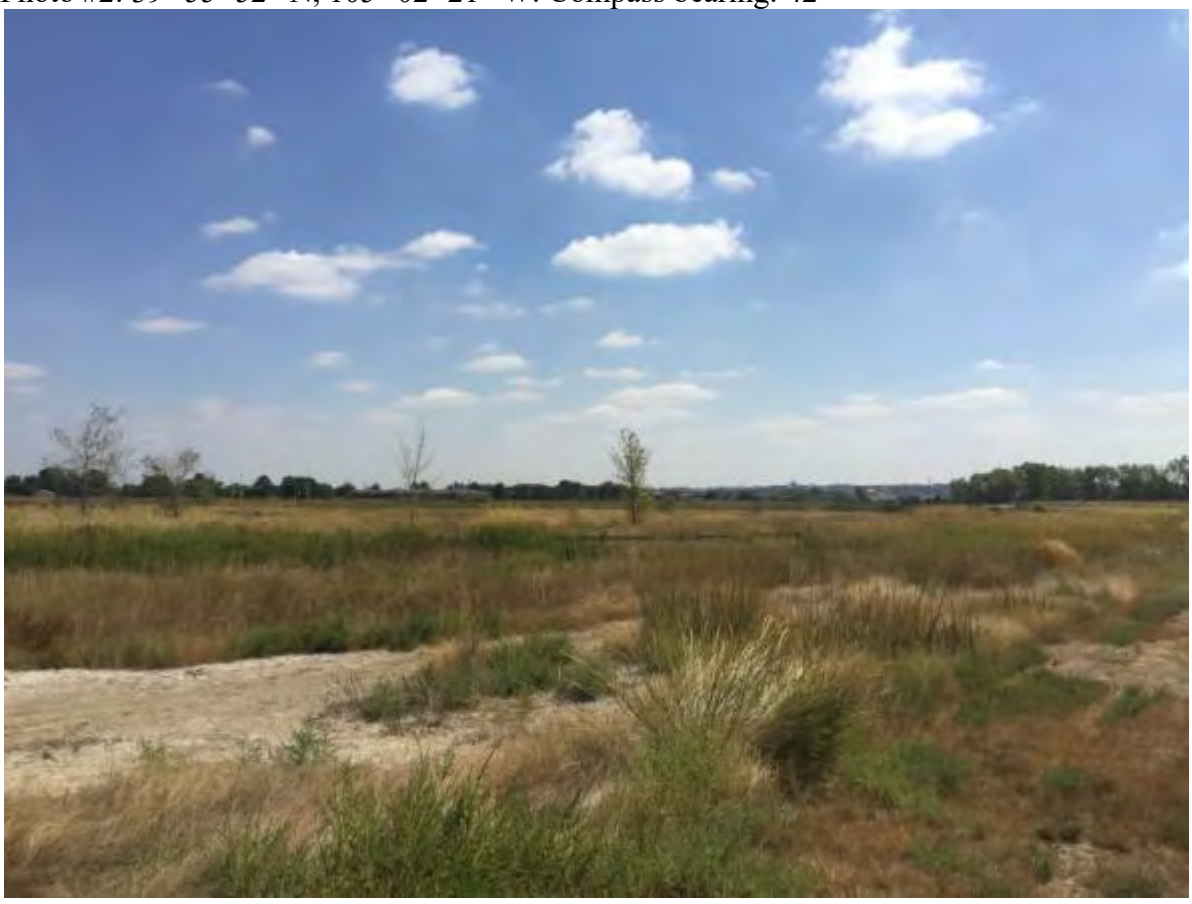


Photo #3: 39° 55’ 53” N, 105° 02’ 23” W. Compass bearing: 112°

Photo #4: 39° 55’ 53” N, 105° 02’ 23” W. Compass bearing: 52°

Photo #5: 39° 55’ 53” N, 105° 02’ 23” W. Compass bearing: 345°

Photo #6: 39° 55’ 56” N, 105° 02’ 30” W. Compass bearing: 357°

Photo #7: 39° 56’ 47” N, 105° 01’ 30” W. Compass bearing: 63°

Photo #8: 39° 56’ 47” N, 105° 01’ 30” W. Compass bearing: 6°

Photo #9: 39° 56’ 50” N, 105° 01’ 26” W. Compass bearing: 290°

Photo #10: 39° 56’ 50” N, 105° 01’ 26” W. Compass bearing: 256°

Photo #11: 39° 56’ 50” N, 105° 01’ 26” W. Compass bearing: 196°

Photo #12: 39° 56’ 51” N, 105° 01’ 28” W. Compass bearing: 263°

Photo #13: 39° 56’ 51” N, 105° 01’ 28” W. Compass bearing: 283°

Photo #14: 39° 56’ 48” N, 105° 01’ 30” W. Compass bearing: 315°

Map notes: Red polygons represent the restoration area from the project. I tried to copy these polygons from old maps, so they may not be exact.

Map #1: Commons OS photo points

Map #2: Plaster OS photo points and willow location

WRV QUICK MONITOR

Project Name: Broomfield Riparian Planting for Wildlife
Location: The Field Open Space
Project date(s): 4-4-2014 **Monitoring Date**: 7-16-2015
Monitor(s): Laura Backus

Project goal(s): Plant native cottonwoods and willows adjacent to pond wetland areas to enhance these areas for wildlife habitat. An additional goal was to benefit the neighborhood to the east by growing a visual barrier of peach-leaved willow to replace Russian-olive removed by the Open Space Department.

Techniques used and their effectiveness:

- Plains cottonwood poles in pre-drilled holes, backfilled with mixture of sand and soil:
  19 survivors out of 193 plantings, but survivors were very difficult to distinguish from volunteers.
  Survivorship of plains cottonwood was low. Note that the planting holes had been drilled into wetland soils instead of the much more appropriate slightly higher riparian zone. During a site visit in September 2014, I noted that small rodents had been girdling the bark at the base of the plantings. At the time of the 2015 site visit, the Open Space Department had installed caging around the base of the plantings, but many trees were too damaged to survive.
- Sandbar willow poles in pre-drilled holes, backfilled with mixture of sand and soil:
  45 surviving willow clumps with an average of 3 holes per clump which equals about 135 surviving poles out of 150 planted. Note that willow trimmings were pushed into the soil.
  The sandbar willow plantings were successful; willow areas have increased.
- Bare root peach-leaved willow plantings, each with a square foot weed barrier, planted into a low area of upland meadow. ????type of barrier
  7 survivors out of 30 plantings
  The peach-leaved willow plantings were moderately successful.

Given the missplacement of the planting holes, it was difficult to evaluate the effectiveness of the backfill mix of sand and soil on plant growth. However, this mix was very clean and efficient to use, especially considering the difficulties of using mud slurry in clay soils.

General observations (e.g., weediness, erosion):
Minor Canada thistle was present at the wetland edges, and 5-10 Russian-olive saplings are present in the southeast corner of the project area.

Did the project meet the goals?
The sandbar willow and peach-leaved willow plantings are on track to provide wildlife habitat and visual screening.
The plains cottonwood plantings had very low survivorship and probably will provide only a minor increase in wildlife habitat.

Did the project cause any untended consequences?
None observed

Corrective or Maintenance activities needed:
Redo the cottonwood plantings, using correct placement of drilled holes.
Remove Russian-olive saplings and contintue to monitor for new saplings.

Other pertinent information (flood, fire, construction, wildlife observations):
None observed

Important lessons for future WRV projects:
Work with client on placement of planting holes into areas of appropriate soil moisture.
¿Should WRV proceed with a project when the planting holes are so misplaced that species survival is unlikely?
Protect cottonwood plantings:

- Cage every cottonwood planting with mesh extending at least 18 inches up the pole.
- Or paint bottom 2 to 3 feet of pole with paint mixed with sand.

Bare root plantings are slow to establish; use 1 - 5 gallon containers whenever possible.
Make sure that we have a more representative selection of Before photos.

Monitoring Photographs

Monitoring Photo Locations

The Field Open Space, Broomfield - Monitoring photos 7-16-2014

Photo1: Section 1 to West, no surviving cottonwoods

Photo 2: Sections 2-8 to SE, no cottonwood survivors evident

Photo 3: Sections 9-10 to NNW, cottonwood saplings, probably mostly volunteers

Photo 4: Sections 11-12 to NE, no cottonwood survivors in photo,
1 survivor of this area not in photo.

Photo 5: Sections 13-18 to ENE, no cottonwood survivors

Photo 6: Peachleaf willow planting area. Note several surviving trees in photo right

Photo 7: Sections 19-21 - high willow survivorship at edge of cattails, note several small peachleaf willow in meadow.

Sections 22-24 - No photo, no surviving cottonwoods

WRV QUICK MONITOR

Field supplies: form, project crew leader notes, team debrief notes and As Built information, pre-project photos or post-project photos, project aerial map or site drawing, Google Earth pre-project and current aerials, pencils, markers, GPS, compass, field guides, collecting bags, camera,

Project Name: Coot Pond
Location: St. Vrain State Park, Longmont
Project date(s): April 2007 **Monitoring Date**: Aug 29, 2015 (8 years later)
Monitor(s): Gwen Kittel and Tim Kittel

Project goal(s): Vegetate 1800 feet of shoreline on a newly created pond (part of I-25 corridor mitigation)

Techniques used and their effectiveness: Bulrush planting—very successful; Erosion matting—very successful; container vs. balled & burlapped unable to determine as I do not know which species in which areas but some success for sure, willow poles—very successful. Seeding of native herbaceous grasses very successful, most of the ground cover was dominated by native grasses (side oats grama, blue grama, Tall blue stem, saltgrass, Indiangrass (*Sorghastrum avenaceum* = *S. nutans*.), *Elymus* spp., switchgrass, and many others). There were a few places where trees have died as they are too close to or below the water line (these in the Southeast corner). Also observed dead peach-leaf stems on the North east corner, not sure why these have died. Some have been cut away.
Coyote Willow is super abundant and rings the lake, as do the bulrushes at the water's edge. Cottonwoods are all thriving and very tall (~20 feet). Peach-leaf willow thriving, also getting large (8-10' tall). Sumac, current, plum shrubs are also scattered throughout, not super abundant. All of the woody vegetation has native herbaceous understory that is very dense. This is successfully preventing weed encroachment and erosion.

General observations of weediness, plant survival, erosion: Overall not much weediness and very little erosion. A few weedy areas in limited spots. Almost no weeds observed other than white clover scattered along the trail edge, and large patch of cheatgrass on the sw edge with ~6 Russian knapweed plants, also right on trail edge

Did the project meet the goals? In spades! The entire surrounding area is heavily vegetated with native trees, shrubs and herbaceous plants.

Did the project cause any untended consequences? None that I observed

Corrective or Maintenance activities needed: Crack willow needs to be eradicated. I documented each plant location with GPS pts (about 8-10), tamarisk is also there, only about 3-4 plants, also GPS location documented. Cheatgrass and Russian knapweed occurs in small patches on the southwest side of the pond.

Other pertinent information (flood, fire, construction, wildlife observations): Pair of grackles.

Important lessons for future WRV projects:

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions.

Dee grasses

Dense native herbaceous cover, east side of pond

Thick bulrush and cattails, NE corner

Native grasses, native woody, bulrush and cattails, view from east side

Peach-leaf willow, native grasses, cattails, southeast side

Thick native grass cover, east side, note Russian knapweed at trail edge

Dense grass understory on east side, dead peach leaf willow stems

NE fishing pier areas, dense native vegetation lines lake shore (peach-leaf willow in foreground)

Indiangrass in foreground

View of north shore, east looking west.

Thick shoreline vegetation including milkweeds

Thick willows, cottonwoods

Thick willows and cottonwoods, SW corner

Thick bulrush, cattails, SE corner

View from fishing pier, SE corner, thick bulrush.

Thick native vegetation, SE corner

Tamarisk at fishing pier, SE corner

Dead trees, SE shore

Dense coyote willow and tall cottonwood SE side.

Dense native grass with some cheat grass

Thick native vegetation

Dense native grass understory

Well vegetated lake shore, all around.

WRV QUICK MONITOR

Field supplies: form, project crew leader notes, team debrief notes and As Built information, pre-project photos or post-project photos, project aerial map or site drawing, Google Earth pre-project and current aerials, pencils, markers, GPS, compass, field guides, collecting bags, camera,

Project Name: Eldorado Canyon Flood Repair 2
Location: Eldorado Canyon State Park
Project date(s): September 11, 2014 **Monitoring Date**: July 23, 2015
Monitor(s): Laura Backus

Project goal(s):
Jump start willow revegetation on streambanks washed out by September 2013 floods

Techniques used and their effectiveness:
Willow survival was too low to determine if painting the tops and using old sheeting to line the holes are effective techniques.

General observations of weediness, plant survival, erosion:
Willow survival was very low, especially on north side of river near the visitor center.

Did the project meet the goals?
Only partially - many willow clumps were damaged or removed, probably by park visitors. Many of the remaining clumps are still in the high waters of the stream.

Did the project cause any untended consequences?
None observed

Corrective or Maintenance activities needed:
Decide if willow plantings are feasible in a heavily used visitor area.
Replant willows only if for the first 2 or 3 years they can be fenced and labeled as a stream restoration project.

Other pertinent information (flood, fire, construction, wildlife observations):
Very rainy spring and early summer have continued to result in high flows in South Boulder Creek.
The Park's plantings of native trees and shrub species recommended by WRV are surviving very well. Most planting areas are clearly marked as restoration projects and fenced off from visitors.
As happened in most stream banks heavily impacted by the 2013 floods, the most vigorous willows are those regrowing from rootstock left in the banks. Protecting remnants of willow and cottonwood root stock is probably the most effective method of speeding up revegetation.
In contrast, many greatly impacted stream banks in Boulder County which were not regraded by heavy equipment or subject to visitor trampling have had very good growth of willow seedlings.

Important lessons for future WRV projects:
Don't install plants in obvious and accessible areas of high visitor use and social trails.
Install willow clumps at varying distances from the edge of water to be ready for unknown flow regimes during the first few growing seasons.

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions

Minor growth of willows on the north bank near the Visitors' Center. Note that these stems are probably only out of the stream flows.

No willows left in this clump on the north bank near the Visitors' Center.

Willows resprouting from root stock.

Willow plantings in areas of less visitor use show better survival.

Surviving willow plantings on the less heavily used south bank.

Willow plantings on the densely compacted south bank reconstruction area at the upstream end of the project area.

Very good survival of the Park's native tree and shrub plantings in fenced and labeled areas.

WRV QUICK MONITOR

Project Name: Left Hand Creek Russian-Olive Removal
Location: Left Hand Creek between US 287 and SH 119 in Longmont, CO
Project date(s): August 17, 2005; May 28, 2008 **Monitoring Date**: August 12, 2015
Monitor(s): Laura Backus

Project goal(s): Remove the hundreds of State-listed noxious Russian-olive seedlings and saplings which had invaded a riparian area of Left Hand Creek which was restored in 2002 as part of the Ken Pratt Boulevard Extension project.

Techniques used and their effectiveness: The crew used weed wrenches and shovels to uproot and remove Russian-olive saplings as well as loppers and saws to cut over-hanging branches and sever roots. Although we had some concerns about portions of roots being left in the ground, this technique appears to have been effective as indicated by the reduction of Russian-olive from hundreds of saplings to 2 large saplings plus one mature tree.

General observations of weediness, plant survival, erosion:
Only three Russian-olive were observed and no tamarisk. Several crack willow which were present prior to the road construction project are still present. There are minor infestations of musk thistle, Canada thistle, teasel, and mullein.
Non-native reed canarygrass and smooth brome have become dominant species in the riparian area. Few or none of the native grass plantings survived from 2002.

Did the project meet the goals? Yes. At the time of the 2005 and 2008 projects, the restoration site was on a trajectory to development of a Russian-olive dominated floodplain.

Did the project cause any untended consequences?
None observed

Corrective or Maintenance activities needed:
Contact the City of Longmont to remove the 3 Russian-olive still present as well as crack willow.

Other pertinent information (flood, fire, construction, wildlife observations):
The September 2013 floods inundated the entire floodplain of Left Hand Creek in the project area. Much of the bank vegetation along the pre-project stream channel survived. However, high waters scoured out nearly all woody vegetation in the overflow channel to the south of the original channel except for well-developed cottonwood plantings and other woody plantings.
It is very likely that if WRV had not removed Russian-olive from the floodplain, many of these trees would have been large enough to survive the floods, produce more seed, and continue dominance of the riparian area.
Because the overflow channel is currently mostly unvegetated dry sand, the future condition of this area is difficult to determine.
Plains cottonwood and peach-leaf willow are colonizing some riparian areas.
A can with a label which appears to indicate chemical contents was present in the riparian area. The flood may have washed in other problem items.

Important lessons for future WRV projects:
Removing Russian-olive saplings from riparian areas has long-term positive effects.
WRV and/or the City of Longmont should revisit this area in two to three years to see if a future noxious weed removal project is necessary.
Weed wrenches were effective even if a small portion of the root system was left in the ground.

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions

2005. WRV crew removes Russian-olive from the Left Hand Creek floodplain, view to north.

2015. No Russian-olive! Check back as flood recovery proceeds. View to north.

Left Hand Creek south of Ken Pratt Blvd.
Locations of Russian-Olive, crack willow, and chemical container

WRV QUICK MONITOR

Project Name:
Location:
Project date(s): **Monitoring Date**:
Monitor(s):

Project goal(s):
Techniques used and their effectiveness:
General observations (e.g., weediness, erosion):
Did the project meet the goals?
Did the project cause any untended consequences?
Corrective or Maintenance activities needed:
Other pertinent information (flood, fire, construction, wildlife observations):
Important lessons for future WRV projects:

Comparison Photos: Attach labeled photos and aerial photo marked with photo locations and compass directions