



**ANTERO**  
RESOURCES

## **Battlement Mesa Natural Gas Development Plan**

**Meeting #9**

**Post Drilling and Completion Activity and Interim and  
Final Reclamation**

**November 4, 2009**

# BMOGC Meeting Series – Brief Overview



- July 1<sup>st</sup> – Introductory Meeting (define future mtgs and public involvement process)
- July 29<sup>th</sup> - Pad Locations, Facilities, and Setbacks
- August 5<sup>th</sup> - Surface Use Agreement
- August 19<sup>th</sup> - Drilling Schedule and Pace
- September 2<sup>nd</sup> - Traffic Plan
- September 16<sup>th</sup> – Drilling, Completion, and Water Management Plan
- October 7<sup>th</sup> – Environmental Program (Part 1 - Air Quality)
- October 21<sup>st</sup> - Environmental Program (Part 2)
  - Emergency Response Plan and Pad Security Plan
- **November 4<sup>th</sup> – Post Drilling and Completion Operations and Interim and Final Reclamation**

(All meetings are open to the public and times are posted in *Grand Valley Echo* and on [battlementmesacolorado.com](http://battlementmesacolorado.com) website)

# Meeting Purpose

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- Post Drilling and Completion Operations
- Interim and Final Reclamation
- Question and Answer Session
- Further Meetings/Discussions?

# Post Drilling and Completion Operations



- Workovers
- Fluid Trucking
- Automation System
- Pumpers
- Phase 2 Completions (Mancos wells)

# Post Drilling and Completion Operations



## Workovers

- Drill out frac plugs/run tubing
- Clean out wellbore (sand)
- Tubular maintenance
- Daylight hours

## Related Equipment on-site

- Workover rig or coiled tubing unit (truck mounted)
- Pump skid (6 ft x 12 ft)
- Frac tanks (500 bbls)
- Nitrogen truck
- Wireline unit (truck mounted)
- Trailer (supplies)
- Pick-up trucks (workers)
- Snubbing stack (on wellhead)



Workover Rig

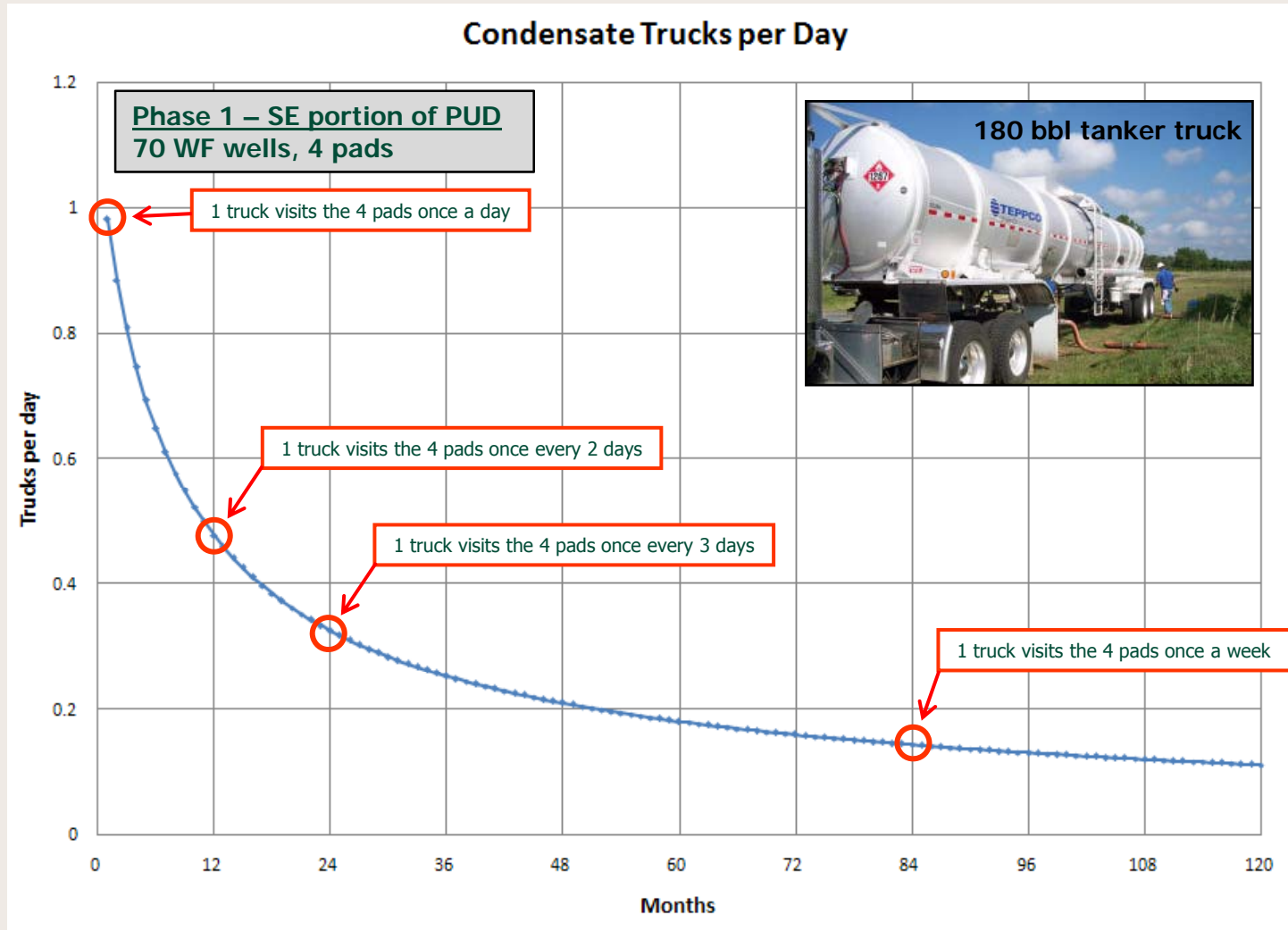


Coiled Tubing Unit

## Fluid Trucking

- Produced water hauling inside PUD will be virtually non-existent once the water facility (pad F) is constructed and operational
- Produced oil (condensate) hauling
  - Battlement Mesa area Williams Fork wells 1.78 bbls oil per mmcf of gas
  - Average Williams Fork well = 2,000 mmcf (2 Bcf)
  - 3,560 bbls oil per well over 30 years
  - 180 bbls truck capacity
  - Approx. 20 truck loads of oil per well throughout life of well

# Post Drilling and Completion Operations



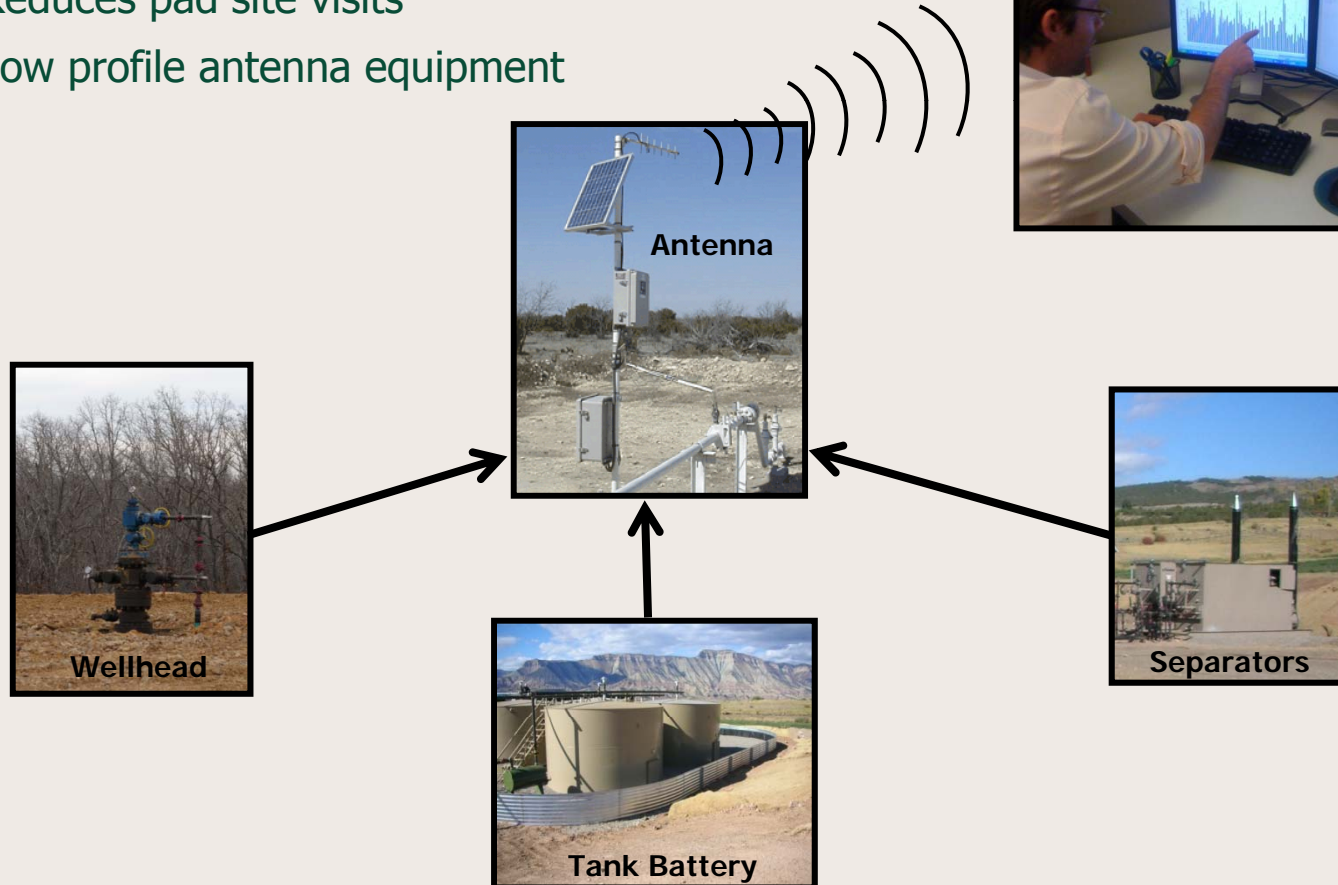
# Post Drilling and Completion Operations



## Automation

- Remote monitoring
- Reduces pad site visits
- Low profile antenna equipment

SCADA analyst





# Post Drilling and Completion Operations



## Pumpers

- A pumper is a person (employee)
- Visits well site daily (pick-up truck)
- Primary function is production enhancement and well site safety
  - Checks fluid levels in tanks (gauges oil levels)
  - Checks thief hatches and Enardo valves on condensate and produced water tanks
  - Check dump valves from separator
  - Checks tank and load-out valve integrity
  - Checks pilot light on combustor
  - Performs preventative maintenance
  - Responsible for downhole maintenance

# Post Drilling and Completion Operations



## Phase 2 Completions (Mancos wells)

- Use workover rig to pull tubing from wellbore
- Set plug above upper Mancos perforations (wireline)
- Fracture stimulate uphole Williams Fork targets
- Use workover rig to drill-out frac plugs and run tubing back in well
- 20 Mancos wells with 7 uphole Williams Fork frac stages would take roughly 3 months to complete (1 month of fracing)



Frac Equipment and Crew

# Interim and Final Reclamation

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- Reclamation - Overview
    - COGCC Rules
    - Reclamation Objectives
    - Components of Reclamation Effort
      - Site Preparation
      - Interim Reclamation
      - Site-specific Reclamation/Reveg Plan
    - Antero Reclamation Projects
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# COGCC Interim Reclamation Rule 1003



- Disturbed areas – pipeline right-of-ways, well pads, access roads
  - Must be reclaimed to their original condition or final land use as early as practicable
  - Must be maintained to control dust and minimize erosion and noxious weeds
  - Pit reclamation rules not applicable because Antero utilizes pitless closed-loop drilling techniques as a Best Mgmt Practice
- Exceptions
  - Areas affected by drilling or subsequent operations to begin within 12 months
  - Areas reasonably needed for production operations
- Interim Reclamation
  - Occurs no later than 3 months on crop land or 6 months on non-crop land for areas no longer in use
  - Rule includes detailed reclamation standards, seeding methods
  - Complete when vegetative cover is 80% of pre-disturbance levels
  - Reclamation effort memorialized with submittal of COGCC Form 4

# COGCC Final Reclamation Rule 1004



- Commences following plugging and abandonment of a well and completion of pipeline projects;
  - Well locations, access roads, production facilities, pipelines are reclaimed and kept free of weeds,
  - Comply with interim reclamation standards,
  - Equipment and debris removed, location graded and recontoured,
  - Final reclamation memorialized via submittal of COGCC Form 4.

# Reclamation – Objectives

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- Revegetation of disturbed areas to stabilize soils and establish a plant community
  - Plant community contains little undesirable vegetation and is capable of supporting post disturbance land uses
  - Achieved when vegetative cover is 80% of pre-disturbance levels
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# Key Components of Antero's Reclamation Strategy

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- Site preparation
  - Interim reclamation
  - Site-Specific Reclamation/Reveg Plan
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# Reclamation - Site Preparation



- Remove/isolate topsoil from poor-quality subsoil
- Seed topsoil piles with quick germinating cover grasses
- Implement soil conservation techniques such as surface manipulation and re-contouring, and drainage management
- Goal – To establish stable slopes, water courses and drainage features to minimize erosion and sedimentation



# Interim Reclamation



- Purpose
  - Involves the reclamation of areas disturbed during the well pad construction but not needed during the productive life of the well
- Objectives
  - Stabilization of disturbed areas – implementation of wind and stormwater BMPs
  - Establishment of non-invasive plant communities
  - Comply with goals and objectives of site-specific Reclamation/Reveg Plan



# Site-Specific Reclamation/Reveg Plan

- Completed for each well pad, pipeline project
- Complies with Garfield County Regulations
- Based on information obtained from field inspections
  - Following parameters evaluated;
    - Local land use
    - Soil types
    - Terrain/slope gradient/elevation
    - Description of local vegetation communities and habitats
    - Noxious weeds
    - Wetland/Drainage surveys
- Recommendations for Reclamation Success
  - Seed mix and methods suitable for area
  - Define reclamation goals (See COGCC Rule 1003)

# Antero Reclamation Projects

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- **Successful Reclamation**
  - Obtained when the area being reclaimed reaches 80% vegetation cover compared to the surrounding area
  - Re-seeding occurs twice a year until final reclamation achieved
  - Seed mix includes perennial and annual plant species

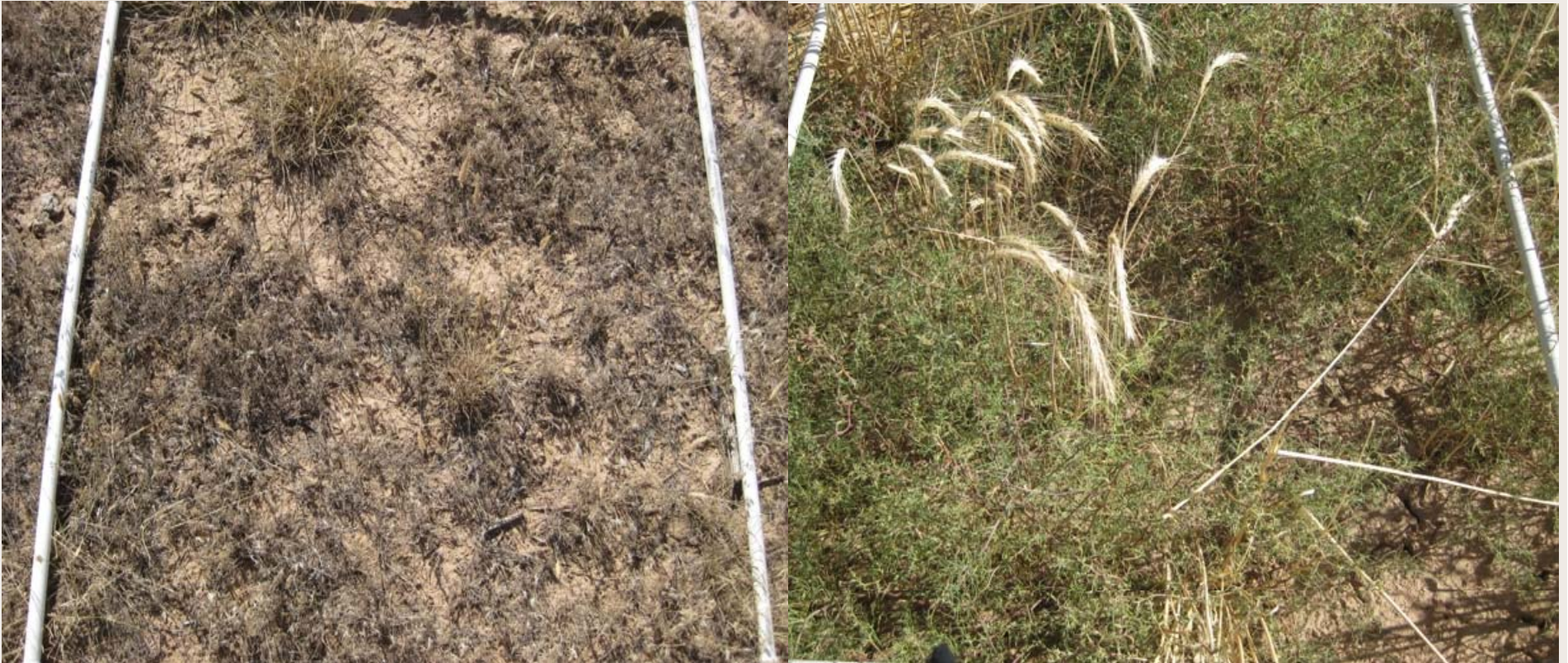
## Example of Final Reclamation: Robinson C Pad to Weinreis A Pad: Pipeline ROW



- Vegetative cover in the surrounding landscape was 50%.
- Site had approximately 60% pre-disturbance vegetative cover,
- The relative canopy cover for this pipeline ROW is approximately 110%
- Successful reclamation because > 80% vegetative cover



## Successful Final Reclamation: Weinreis A Pad to Robinson C Pad: Pipeline ROW



- To determine whether a site achieved 80% or greater cover the surrounding canopy is compared to reclaimed area
- The picture on the left represents a 2' x 2' area of the surrounding cover (Reference Area),
- Picture on the right is reclaimed site.



Close-up - Surrounding Area (Reference Area):  
Weinreis A Pad to Robinson C Pad: Pipeline ROW





Close-Up - Final Reclamation (110% relative canopy cover):  
Weinreis A Pad to Robinson C Pad: Pipeline ROW





## Weinreis A Pad to Valley Farms B Pad: Pipeline ROW



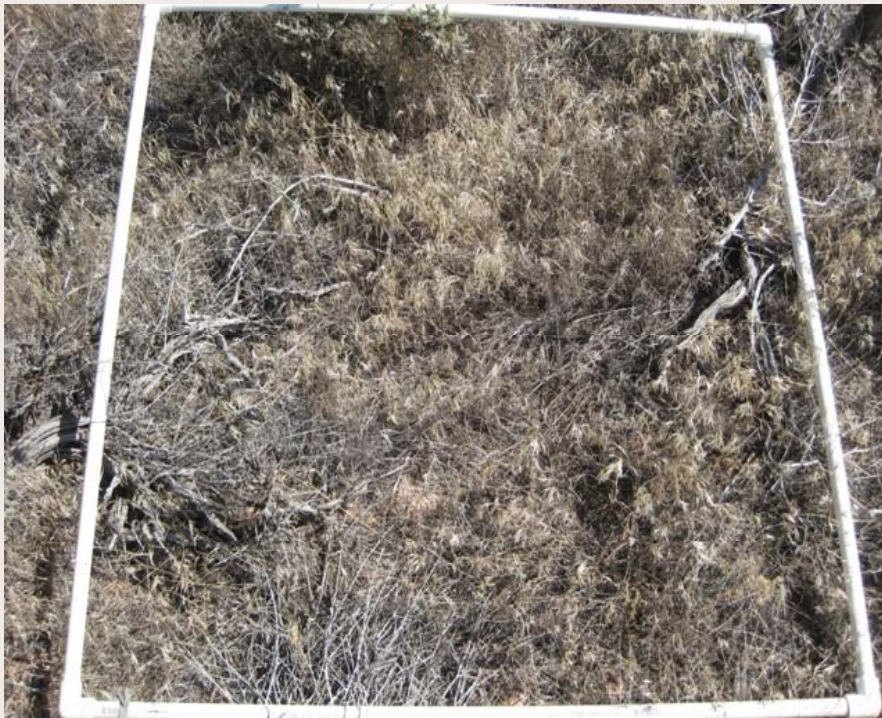
- ROW has approximately 15% vegetative cover,
- Surrounding landscape has approximately 50% canopy cover,
- ROW has approximately 40% relative canopy cover,
- Vegetative cover is below the 80% reclamation criteria to release the site



# Weinreis A Pad to Valley Farms B Pad: Pipeline ROW



**Surrounding Reference Area**  
(50% canopy cover)



**Ongoing Final Reclamation**  
(40% relative canopy cover)





## Gypsum Ranch A Pad to Gypsum Ranch B Pad: Pipeline ROW



- ROW has portions of sparse vegetation cover, portions with dense cover,
- ROW must have 80% or more vegetative cover compared to the surrounding area,
- Overall ROW vegetation cover is approximately 50%,
- Vegetation of surrounding area is lush due to the proximity of river (approximately 85%)
- Relative canopy cover for ROW is 60% (below reclamation success criteria)



## Gypsum Ranch A Pad to Gypsum Ranch B Pad: Pipeline ROW



Surrounding Reference Area  
(85% canopy cover)



Ongoing Final Reclamation  
(60% relative canopy cover)



# Question and Answer Session