FINAL REPORT ON DOT WORKSHOP,
Integrating Stream Restoration Principles & Transportation Maintenance

Keystone Restoration Ecology for Stream Dynamics Inc.

June 30, 2013

Introduction: This report describes a workshop given to the New Mexico Department of Transportation on May 6-8, 2013. This project was originally a bank erosion project on the Gila River near the Gila Cliff Dwellings, however, the Whitewater/Baldy Complex fire in May 2012 created the conditions for extreme flooding and caused the project to be put off. As a portion of the project was to demonstrate new techniques for bank protection to the NM DOT, the project morphed into a DOT training workshop.

There were four broad goals to the workshop:

1. Introduce the priniciples of natural channel design to DOT design engineers
2. Integrate these principles into drainage design and bridge design projects
3. Teach basic surveying techniques to enable DOT staff to use these principles
4. Provide examples of projects using these principles on the ground

The workshop involved a collaboration between Stream Dynamics (Van Clothier, the general contractor for the workshop), Keystone Restoration Ecology (Steve Vrooman), Natural Channel Design Inc. (Alan Haden), and RiverSource (Rich Schrader). A pre-workshop phone conference was held in January 2013 between the contractors, Anne McLaughin of the DOT, and Maryann McGraw and David Menzie of the NMED Surface Water Quality Bureau. In addition, Steve Vrooman of Keystone interviewed Maryann McGraw of the NMED about her many year's experience working in the DOT in Feb 2013.

Attendees:

The workshop had 28 participants, most from the NM DOT. Eighteen attendees were from the DOT, mostly from the Drainage Design Bureau and the Environmental Bureau. One attendee was a bridge designer (Hasheem Faidi), having more participants at this workshop engaged in this work would have been very productive.

The rest of the attendees varied from the City and County of Santa Fe (stormwater and planning), tribal Agencies (Acoma Pueblo and Navajo Nation) and the US Army Corps of Engineers, Albuquerque Branch.

Workshop Topics:

A workshop outline was created (see below) to introduce these concepts, show examples of stream crossings integrating the natural channel design principles, and teach some basics of natural channel design. Three ½ day field trips were included in workshop.

Major Principles/Topics Covered in Classroom:

1. Natural Channel Design Introduction (Vrooman)
2. Streams and Roadways (Haden)
3. Natural Channel Design and Hydrology, Stream Classification (Clothier)
4. Computer Modeling (Haden)
5. Water Harvesting Principles and Examples (Clothier)
6. Discussion on Common Maintenance Problems and Solutions (Vrooman)
7. Natural Channel Design structures (Vrooman)

	MAY 6TH MON	MAY 7TH TUES	MAY 8TH WED
Morning Session 1: 9:00 – 10:00	Natural Channel Design	Practical Use of Computer Models	Valles Caldera National Preserve Project Site Tour
Morning Session 2: 10:15 – 11:00	Classification of Stream Channels	Intro to Water Harvesting	Water Canyon East Fork Jemez River
Morning Session 3: 11:15– 12:00	Watershed Hydrology	Discussion Common Maintenance	Fire Effects: Santa Rosa project site
Afternoon Field Visit: 1:00– 4:30pm	Apache Canyon Restoration Project in Canoncito	Hwy 14 Galisteo River	Indios Crossing project site

Field Sessions:

The first afternoon field day was to a nearby open space (Eldorado Community Association Wilderness) where Keystone Restoration Ecology had designed and implemented several projects. This field trip showed examples of natural channel design structures and a successful project. In addition, basic surveying techniques were taught to enable participants to determine their Rosgen Stream Type in order to design the proper size and slope of stream crossings such as culverts, bridges and box culverts.

The second field day involved a trip down State Highway NM 14 to Cerrillos NM. This recently completed project had some excellent examples of well-designed work by the DOT, as well as one problematic stream bridge over the Galisteo River. Techniques for reading the landscape and understanding erosion patterns were taught.

The last day of the workshop involved a visit to the Jemez Mountains in order to understand post-fire flooding dynamics and to study a variety of stream crossing examples. A major crossing repair on NM Highway 4 at Water Canyon was analyzed and a meeting with Sam Loftin PhD of Los Alamos National Laboratory was held to explain some of the project. The rest of the day was spent at the Valles Caldera National Preserve to show examples of post-fire flooding, floodplain culverts, and a unique project at Rito de Los Indios that included a fish passage example and a "flow splitter" on an alluvial fan. This project has survived 10+ post fire flood events of "20 year" floods and above with no need for repair or maintenance.

Workshop Results/Evaluations:

Overall, there was excellent participation and interest from the attendees. As many of these professionals "self-selected", that may be expected. However, the training outline and materials gathered (including the workbook) appeared to instruct and inspire the attendees. Many attendees asked for more training that was specific to their jobs, and the idea has even been floated of workshops every 6 months for the NM DOT.

Some specific comments and criticisms are listed below:

1. Explain the difference between FEMA 100 yr floodplain and the Natural Channel Design floodplain.
2. Integrate specific examples for teams to work on (use a real arroyo, design a crossing that meets criteria for flooding, sediment transport, and fish passage).
3. Get FHWA (Federal Highway Administration) attendees at further workshops.
4. Bring modeling and theory in at the beginning, continue to justify the practice of Natural Channel Design.
5. Go through phasing of projects, including planning, design, permitting, and implementation. Explain how these techniques will improve and simplify permitting issues with Army Corps. Have more Army Corps participation.
6. Get this information out to the 19 Pueblos in New Mexico and their corresponding road departments, especially for water harvesting and road drainage.
7. Comparison between information presented here and FHWA Publications and Manuals, as well as comparison between these materials and DOT criteria and manuals.

8. Teach more about removal of tamarisk and its effect on road drainage and bridge stability

9. More detail on Vane Structures with drawings and specifications.

10. Show an example in the classroom of a bridge design with the natural channel design parameters such as floodplain width, slope, channel width, and bridge location in the meander pattern.

11. Show an example of how to adjust meander patterns to allow a bridge to be installed in the right of way.

12. Many participants noted that the DOT has a narrow (200 feet or less) right of way, many of these systems need treatment for 100s or 1000s of feet upstream and downstream to ensure stability and prevent scour and erosion. This lead to a discussion on how to integrate these narrow corridors into larger projects that restore the stream or arroyo channel and funding sources for this work.

13. Comments from Chris Cudia, NM DOT. I received positive feedback as well. The general consensus was the workshop presented concepts that could reduce road maintenance costs, streamline Clean Water Act section 404/401 permitting, and make more efficient use of wetlands mitigation funds. Application of these principles would also facilitate fulfillment of the NMDOT's environmental preservation goals. This workshop provided attendees with ample time to network and those I spoke with appreciated the conductive atmosphere.

14. If we do have a follow-up, some attendees suggested more focus on NMDOT projects and opportunities. Technical aspects (physics/math) were readily comprehended by the majority of attendees so we may have been able to delve deeper into specific structural designs and applications. One theme I heard several times was the NMDOT is restricted to activity in the right-of-way and this presents certain challenges. Some of those issues were addressed by the discussion of sediment rating curves and how structural designs can be adjusted to maximize efficient transport of flow and the erosional debris of watersheds. These topics were very well received and appear to have generated the most conversation.

15. Field trip to Valles Caldera was too long, this should be replaced with a team design exercise using these principles.

16. One interesting note was created by a visit to the San Marcos Wetland Restoration Project designed by Keystone Restoration Ecology (Vrooman) and funded by NMED Wetlands Project. Chris Cudia of DOT noted that the 6-8K cost per acre of wetland restoration was an order of magnitude cheaper than the DOT currently pays for projects that are minimally successful and require maintenance. Using DOT wetland mitigation funding to restore natural wetlands is much easier and cheaper and gives a much greater environmental benefit.

General Conclusions of Stream Dynamics Teaching Team:

1. Excellent attendees made this very enjoyable, many contacts for future work were made

2. All of the conclusions above were correct, the classroom material presented would be used again, with an addition of a "design project" example for teams that would walk through a process for the DOT to use these concepts.

3. If a “design project” is used, we would need to create these steps for the DOT to implement, this would require some thinking and preparation of new materials.

4. The field trips would be changed to directly benefit the “design project” idea and example.

5. Small teams would present their design projects for critique by the class on the last day.

6. NMED and Teaching team needs to understand how the FHWA design manuals work and figure out how to integrate our work into these manuals so that it becomes procedure, not an additional piece of work. This could be the subject of a future grant opportunity, to fully integrate this material into the design process for bridge and drainage design.

7. The teaching team wants to take this workshop to all 50 States!

8. One simple method for integrating these principles is if the DOT were to contract out to a consulting geomorphologist/ecologist to assess each stream channel and come up with recommendations for design. In this way, the 10-15 years of experience (for example) of Alan, Van and Steve could be integrated into the process easily and inexpensively. Instead of having to introduce and train DOT staff in entirely new material and have them integrate it, our input would be easy and immediate, and allow for immediate cost savings and long-term maintenance savings on erosion and scour at stream crossings. This would also allow for more direct training of staff to allow them to master this material in a short period of time and NOT need to hire a consulting geomorphologist after several years of collaboration.

9. It would be very productive to have a workshop focused on bridge designers. Our solitary bridge designer, Hasheem Faidi, had unique perspectives and requirements for his job, and mentioned that all the bridge designs in NM would now be changing over to 120 foot spans (?), removing some of the need for bridge piers and the effects of these piers on stream function and sediment transport.

10. The teaching team would love to present this material again, even on a 6 month cycle. There are many more DOT staff as well as professionals all over the state who could benefit from this type of training. One obvious partnership would be to work with Los Alamos National Laboratory staff on stormwater issues, which may also include contamination transport issues for radionuclides.

11. One workshop idea would be to focus on stormwater harvesting techniques, a hybrid of techniques created by Brad Lancaster and Watershed Management Group in Tucson, Induced Meandering techniques in New Mexico, and integrated by Van Clothier. He has given many excellent talks on this matter, and harvesting stormwater, while not a DOT priority, can both grow vegetation, reduce need for irrigation, and prevent stormwater pollution in our waterways. This work can be integrated into DOT drainage design for culverts and road drains as well.