
APPENDIX E

SECTION 106 PROGRAMMATIC AGREEMENT

**US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District**

WHEREAS, Federal Highway Administration (FHWA), in cooperation with Federal Transit Administration (FTA), Colorado Department of Transportation (CDOT), Regional Transportation District (RTD), and the Preferred Alternative Committee (PAC), has determined that improvements on the US Highway 36 corridor between Denver and Boulder are necessary to meet the purposes and needs of the project as described in the Final Environmental Impact Statement (FEIS); and

WHEREAS, the Advisory Council on Historic Preservation (Council), which issues regulations to implement Section 106 and provides comments to agency officials on undertakings and programs that affect historic properties, has been invited to participate in the Section 106 consultations and has declined to participate; and

WHEREAS, FHWA and FTA have determined that the Preferred Alternative improvements as analyzed in the FEIS of which a portion are selected in the ROD may affect properties included on or eligible for inclusion on the National Register of Historic Places (NRHP) and have consulted with the Council and the Colorado State Historic Preservation Officer (SHPO) to develop this Programmatic Agreement (Agreement) pursuant to Sections 800.4(b)(2) and 800.14(b)(3) of the regulation (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) and Section 110(f) of the same Act (16 U.S.C. 470h-2[f]); and

WHEREAS, FHWA has agreed to be the lead federal agency for complying with Section 106 of the National Historic Preservation Act and responsible for consultations under 36 CFR 800; and

WHEREAS, CDOT is authorized under a separate Programmatic Agreement with the Colorado Division of FHWA to carry out 36 CFR 800 responsibilities on behalf of FHWA, including consultation under Section 106 of the National Historic Preservation Act and the Council regulations, National Environmental Policy Act (NEPA) analysis, and construction contract administration per FHWA and CDOT Stewardship Agreement; and

WHEREAS, CDOT has agreed to perform consultations under 36 CFR 800 for the US 36 Corridor Preferred Alternative; and

WHEREAS, FHWA and FTA have requested CDOT and RTD to sign this Agreement as invited signatories; and

WHEREAS, FHWA and FTA approved the US 36 Corridor FEIS and Section 4(f) Evaluation to identify an alternative that will meet the purpose and need for the corridor and examine the effects of the alternatives to historic properties; and

WHEREAS, FHWA and FTA approved the US 36 Corridor ROD to select Phase I of the Preferred Alternative consistent with the fiscally constrained plan as required by 23 CFR Part 450; and

WHEREAS, the effect determinations in the FEIS were commented upon by SHPO and consulting parties per the Section 106 process which was substituted in NEPA in lieu of separate correspondence (per FHWA and FTA notification to SHPO and the Council in December 2003 and in accordance with 36 CFR 800.8(c); and

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

WHEREAS, any projects carried out by CDOT and RTD within the US 36 Corridor during the term of this Agreement that were not analyzed within the FEIS shall be subject to separate consultation and compliance actions as specified in 36 CFR Part 800; and

WHEREAS, FHWA, FTA, CDOT, and RTD have determined that modifications to the Area of Potential Effect (APE) (Appendix A), completion of the identification of historic properties, determinations of specific effects to historic properties, and consultation concerning measures to avoid, minimize, or mitigate any adverse effects shall be re-evaluated as part of the planning for and prior to the approval of any construction project that is part of the Preferred Alternative; and

WHEREAS, FHWA, FTA, CDOT, and RTD have consulted with the City of Westminster, the City of Broomfield, Jefferson County Historical Commission, Historic Denver, Inc., City and County of Denver, Town of Superior Historic Designation Commission, Louisville Historic Preservation Commission, Boulder Landmarks Preservation Advisory Board, Historic Boulder, Inc., Colorado Preservation, Inc., and the National Trust for Historic Preservation and these parties have been invited to concur in this Agreement; and

WHEREAS, execution of this Agreement as a concurring party indicates participation as a Section 106 consulting party and acknowledgment that the party's views were taken into consideration; and

WHEREAS, the consulting Native American Tribes listed in Appendix B were provided the opportunity to comment on the FEIS, but none of the tribes submitted comments or otherwise elected to participate; and

WHEREAS, NOW, THEREFORE, FHWA, FTA, and SHPO agree, and CDOT and RTD concur, that the phases of the undertaking shall be administered in accordance with the following principles and stipulations to satisfy FHWA and FTA's Section 106 responsibilities for these undertakings.

PRINCIPLES

FHWA, FTA, CDOT, and RTD shall adhere to the following principles in complying with Section 106 of the National Historic Preservation Act for the undertaking:

1. Consistent with CDOT's Environmental Stewardship Guide and with 36 CFR 800.5(a)(1), FHWA, FTA, CDOT, and RTD shall take into account direct, indirect, and cumulative effects on historic properties and shall consider measures to improve existing conditions affecting historic properties.
2. FHWA and CDOT or FTA and RTD shall seek, discuss, and consider the views of the consulting parties, and where feasible, shall seek agreement with them (800.16[f]) when making decisions under the stipulations of this Agreement.
3. The US 36 Preferred Alternative will have unavoidable adverse effects to historic properties within the APE. These adverse effects must be resolved under the Section 106 regulations 36 CFR 800.6. This Agreement seeks to develop resolution of adverse effects and have high

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

demonstrable public benefits to the citizens of Colorado. These adverse effects will be resolved through the comprehensive creative mitigation as described in this Agreement and in accordance with the Secretary of the Interior Standards. The mitigation will resolve adverse effects for all historic resource types, including but not limited to linear resources, residential properties, and commercial properties for the whole corridor with the creation of a historical book titled "Digging the Old West," based on the Ditch Project exhibit at the Boulder Public Library (see Appendix C and www.ditchhistory.org) and will feature the numerous historic irrigation ditches and canals that parallel and intersect the US 36 corridor.

STIPULATIONS

FHWA and FTA, in consultation with CDOT and RTD where appropriate, shall ensure that the following measures are carried out:

1. Consultation Process

a. Delegation of consultation authority

- i. FHWA authorizes, CDOT, per a separate Programmatic Agreement, to conduct consultation with the SHPO and other consulting parties on their behalf, including identification of consulting parties, determining the level of identification, NRHP eligibility determinations, and determinations of effect.
- ii. FHWA and FTA shall remain ultimately responsible for all findings and determinations and retain responsibility for complying with all federal requirements pertaining to direct government-to-government consultation with Indian tribes and requests to the Council.

b. Method of project delivery: Projects will be contracted as either Design/Bid/Build or Design/Build.

- i. CDOT shall initiate consultation under the terms of this Agreement during the scoping period of construction projects. The consultation will be completed prior to the approval of construction for design/bid/build projects and prior to the Notice to Proceed for design/build projects.
 1. Design/Bid/Build plans are prepared at Field Initial Review (FIR) level (30 percent stage) and Final Office Review (FOR) level (90 percent stage) and Final (100 percent stage) and will be provided as a reference for re-evaluating effects to NRHP eligible or listed properties.
 2. Design/Build submittals are typically prepared at 30 percent level of design and will include re-evaluation of effects to potential and known NRHP eligible or listed properties as well as mitigation strategies and other stipulations written into the contract instructions.

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

- ii. This Agreement will remain in effect unless the way CDOT and/or RTD deliver projects changes from the two methods described above in Stipulation 1(a)(iv). An amendment will be prepared to this Agreement and agreed to among the signatories and invited signatories that establishes the timing of submittals for the Section 106 consultations.
- c. Re-evaluation process:
 - i. CDOT shall ensure that the work described in this section is conducted by personnel that meet the Secretary of the Interior's Professional Standards, as required in 36 CFR 800.2(a)(1).
 - ii. Re-evaluation shall be required at the initiation of each construction project. Re-evaluation consists of revisiting the project area to determine whether new or existing historic properties require new determinations of eligibility and shall also consist of re-evaluating determinations of effect to NRHP-eligible or listed properties if eligibility or impacts are different from what was described in the FEIS and concurred upon by the SHPO.
 - 1. APE Modifications:
 - a. The APE in the FEIS has been attached to this document as Appendix A.
 - b. Should modifications to the APE be necessary, CDOT shall notify FHWA, SHPO and consulting parties. If the modifications affect an FTA action, FTA shall notify SHPO and consulting parties. The notification can be in an electronic format and can include a meeting request for consultation to review the modifications to the APE.
 - 2. Re-evaluations of eligibility
 - a. Re-evaluations of eligibility for previously recorded historic properties shall be done after ten years has passed from the date of the initial recording.
 - b. The passage of time, changing perceptions of significance, changes in the design of the Preferred Alternative or incomplete prior evaluations may require the agencies to re-evaluate properties that were previously determined not eligible; presumed eligible due to inadequate documentation; or newly discovered properties in the APE.
 - c. Consultation shall include newly discovered historic properties eligible for nomination to the NRHP and a re-evaluation of existing properties to determine their status and whether they retain eligibility. The identification for both new and existing properties shall occur concurrently through correspondence to SHPO from CDOT and/or FTA as appropriate.

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

- d. Properties shall be documented using the suite of Colorado Cultural Resource Survey forms and following the standards in the Colorado Cultural Resource Survey Manual.
 - e. If an unusual discovery or a large number of historic properties are identified during consultation, CDOT/FTA shall consult with SHPO to determine if an extended review period is necessary.
 - f. If CDOT/FTA and SHPO are unable to reach a consensus about the eligibility of a property, FHWA or FTA shall seek a determination of eligibility from the Keeper of the National Register of Historic Places, as provided in 36 CFR 800.4(c)(2).
3. Re-evaluations of effects: CDOT/FTA shall re-evaluate effects to known and newly evaluated historic properties within the project APE that are eligible to the NRHP once more detailed project plans have been developed or in light of new information.
4. Resolutions of adverse effects: CDOT/FTA shall apply the criteria of adverse effect (per 800.5) to any new or additional impacts that were not addressed in the FEIS. Should adverse effects occur to these properties, FHWA/FTA and CDOT/RTD shall consult with SHPO and consulting parties to resolve adverse effects per 800.6, including notifying the Council and determining Council participation. All resolutions of adverse effects discovered after the ROD shall be amended to this Agreement.

2. Creative Mitigation:

- a. CDOT shall fund the attached proposal prepared by Karmen Lee Franklin, "Digging the Old West: How Dams and Ditches Sculpted an American Landscape," (Appendix C) into a book that can be distributed to agencies and libraries along the US 36 Corridor. Initial consultation with the SHPO regarding resolving adverse effects resulted in the development of one substantial creative mitigation product to resolve all impacts identified in the FEIS. The mitigation will satisfy adverse effects to all resource types within the corridor APE (ditches and their related components, structures, objects, railroads, roads, monuments, and other resource types that become eligible after the Agreement is executed).
- b. CDOT shall submit the mitigation produced for the project to SHPO and the consulting parties for review and comment.
- c. CDOT shall submit OAHP Level I Documentation including photographs printed on archival paper for any properties that will be demolished or otherwise adversely affected.
- d. CDOT shall submit OAHP Cultural Resource Re-evaluation Forms (Form #1405) for any properties that will be changed or modified in order to document changes in the conditions of the properties for OAHP's site files.

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

3. **Resolving issues or objections:** Should any party to this Agreement object in writing to FHWA and FTA regarding any action carried out or proposed with respect to the implementation of this Agreement, FHWA and FTA shall consult with the objecting party. If, after initiating such consultation, FHWA and FTA determines that the objection cannot be resolved through consultation, they shall forward all documentation relevant to the objection to the Council, including FHWA's/FTA's proposed response to the objection. Within 45 calendar days after receipt of all pertinent documentation, the Council shall exercise one of the following options:
 - a. Advise FHWA or FTA that the Council concurs with FHWA's and FTA's proposed response to the objection, whereupon FHWA or FTA shall respond to the objection accordingly; or
 - b. Provide FHWA and FTA with recommendations, which FHWA and FTA shall take into account in reaching a final decision regarding their response to the objection; or
 - c. Should the Council not exercise one of the above options within 45 calendar days after receipt of the pertinent documentation, FHWA and FTA may assume the Council concurrence in their proposed response to the objection.
 - d. At any time during implementation of any stipulation in this Agreement, should an objection to any such stipulation or its manner of implementation be raised by a member of the public, FHWA and/or FTA shall take the objection into account and consult as needed with the objecting party, the Council, and SHPO to address the objection.
4. **Reporting Requirements:** By no later than June 30th of each year the Agreement is in effect, CDOT shall provide a report to SHPO on the status of the Agreement, including the stipulations that have been implemented. The annual report will also include any recommendations to amend this Agreement or improve communication among the parties. The Council shall be provided a copy of the annual report but shall not be required to comment on the report. The SHPO shall have 30 calendar days to review the annual report.
5. **Amendments:** The SHPO, FHWA, FTA, CDOT, or RTD may request that this Agreement be amended, whereupon they shall consult in accordance with 36 CFR 800 to consider such amendment. No amendment shall take effect until it has been executed by all signatories. In the event of an amendment, the Council shall be notified and FHWA/FTA shall file the resulting amendment with this Agreement.
6. **Termination:** The SHPO, FHWA, FTA, CDOT, or RTD may propose to terminate this Agreement by providing thirty (30) calendar days notice to the other parties explaining the reason(s) for the proposed termination pursuant to 36 CFR 800.6(c)(8). The Council, SHPO, FHWA, FTA, CDOT, and RTD shall consult during this period to seek agreement on amendments or other actions that would avoid termination. If the annual report is not received within 90 days of the due date, the agreement may be terminated at the request of the SHPO. In that case any outstanding mitigation must be completed within six months of the termination request.

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

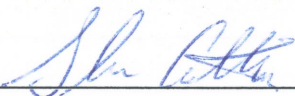
7. **Failure to Carry Out the Agreement:** In the event FHWA/FTA determines they cannot or will not carry out the terms of this Agreement, they will immediately consult with the other parties to develop an amendment to this Agreement pursuant to 36 CRF 800.6(c)(7) and Stipulation 5 of this Agreement. If the signatories cannot agree to appropriate terms to amend the Agreement, any signatory may terminate the agreement in accordance with Stipulation 6, above.
8. **Duration of Agreement:** This Agreement shall remain in effect for a period of ten (10) years after the date it takes effect, unless it is terminated prior to that time. Ninety days prior to the conclusion of the ten year period, CDOT shall notify all parties in writing. If there are no objections from the signatory parties, the term of the Agreement will automatically be extended for an additional five years. If any party objects to extending the Agreement, or proposes amendments, CDOT shall consult with the parties to consider amendments or other actions to avoid termination.
9. **Meeting Requests:** Whenever necessary, SHPO, FHWA, FTA, CDOT, or RTD shall request a meeting of the other parties to discuss the terms of the Agreement.
10. **FHWA/FTA Coordination:** Prior to submitting mitigation to SHPO and consulting parties under the terms of this Agreement, CDOT/RTD shall coordinate with FHWA/FTA, who have the responsibility of oversight of the implementation of this Agreement.
11. **Coordination with National Environmental Policy Act (NEPA):** FHWA and FTA shall use this agreement as part of their responsibility to meet the requirements of NEPA.

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District



Execution of this Programmatic Agreement by FHWA, FTA, and SHPO and the submission of documentation and filing of this document with the Council pursuant to 36 CFR 800.6(b)(1)(iv) prior to FHWA's/FTA's approval of this undertaking and implementation of its terms, is evidence that FHWA and FTA have taken into account the effects of this undertaking on historic properties and afforded the Council an opportunity to comment.

SIGNATORIES:

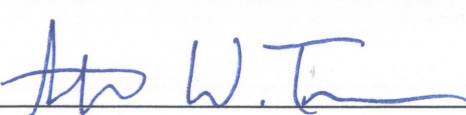

FEDERAL HIGHWAY ADMINISTRATION

By:  12/11/09
FOR: Karla S. Petty, P.E., Colorado Division Administrator Date

FEDERAL TRANSIT ADMINISTRATION, REGION 8

By:  12/11/09
 Terry Rosapep, Regional Administrator, Region 8 Date


COLORADO STATE HISTORIC PRESERVATION OFFICER

By:  12/14/09
 Edward Nichols, SHPO Date

US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

INVITED SIGNATORIES:

COLORADO DEPARTMENT OF TRANSPORTATION

By:  12-11-09

Reza Akhavan, Regional Transportation Director, CDOT Region 6

Date

REGIONAL TRANSPORTATION DISTRICT

By:  December 11, 2009

John C. Shonsey, Senior Manager of Engineering, Chief Engineer

Date

**US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District**

APPENDIX A: Area of Potential Effect (APE)

APPENDIX B: Consulting Parties Participating in Section 106 Consultation: Native American Tribes, Local Governments, Historic Preservation Groups

APPENDIX C: "Digging the Old West: How Dams and Ditches Sculpted an American Landscape," Proposal

**US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District**

APPENDIX A: Historic Sites and Area of Potential Effect, Adams and Denver Segments



US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District

**Appendix A, cont.: Historic Sites and Area of Potential Effect, Westminster, Broomfield, and
Superior/Louisville Segments**



**US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District**

Appendix A, cont.: Historic Sites and Area of Potential Effect, Boulder Segment



**US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District**

**APPENDIX B: Consulting Parties Participating in Section 106 Consultation: Native American Tribes,
Local Governments, Historic Preservation Groups**

Cheyenne and Arapaho Tribes of Oklahoma

Northern Cheyenne Tribe

Northern Arapaho Tribe

Northern Ute Tribe

Southern Ute Indian Tribe

City of Westminster

City of Broomfield

Jefferson County Historical Commission

Historic Denver, Inc.

City and County of Denver

Town of Superior Historic Designation Commission

Louisville Historic Preservation Commission

Boulder Landmarks Preservation Advisory Board

Historic Boulder, Inc.

Colorado Preservation, Inc.

National Trust for Historic Preservation

**US 36 Corridor Programmatic Agreement
among the Federal Highway Administration, the Federal Transit Administration, the Colorado State
Historic Preservation Officer, the Colorado Department of Transportation, and the Regional
Transportation District**

Appendix C

"Digging the Old West: How Dams and Ditches Sculpted an American Landscape,"

Proposal submitted by Karmen Lee Franklin

Digging the Old West

How Dams and Ditches Sculpted an American Landscape

by Karmen Lee Franklin

With a foreword by Patrica Limerick, PhD

Featuring illustrations by more than 20 artists



A Proposal for:

Digging the Old West

How Dams and Ditches Sculpted an American Landscape

By Karmen Lee Franklin

With a foreword by Patricia Limerick

Featuring art by more than 20 artists

Karmen Lee Franklin
8380 w. 87th dr. #A
Arvada, CO, 80005
(720) 364-2655
karmen.franklin@colorado.edu
www.chaoticutopia.com

Contents

Introduction.....	1
Overview	1
Markets.....	2
A Mission Statement	3
Publication and Promotion Plan.....	3
Similar Works.....	4
Resources Needed	5
About the Author	6
Outline	7
List of Chapters	7
Sample Selections.....	17
Coffin v. the Left Hand Ditch Company.....	18
Where the Bison Roamed	24

Introduction

Overview

Zebulon Pike first encountered the rolling plains at the foot of the Rocky Mountains in 1806. The prairie surrounding the gateway into the American West, however beautiful, appeared dreadfully inhospitable. He wrote, "These vast plains of the western hemisphere may become in time as celebrated as the sandy deserts of Africa." Now, over 200 years later, those would-be desert lands support a sprawling metropolis, complete with gardens, lawns, farms and ranches. How did the land transform from an arid wasteland into the colorful landscape of today?

Based on the success of the Ditch Project, *Digging the Old West: How Dams and Ditches Sculpted an American Landscape* will break new ground, combining art, engineering, civics, and ecology into a visual history of a western landscape. The manuscript will contain 280 pages, consisting of 50,000 words, 30 pages of back matter, 40 black and white photographs, 50 color photographs, 30 paintings, 20 maps, and 30 charts and diagrams.

Digging the Old West will:

- Educate readers about the many uses of water, highlighting personal connections to an often underestimated resource.
- Describe the evolution and construction of ditches and dams along the Front Range, featuring multiple sites in and around the cities of Denver and Boulder, Colorado.
- Feature a series of sidebars throughout the text, focusing on different aspects of water use: Water Engineering, Water Wars, Wetlands Ecology, and Influential People.
- Include a series of "then and now" photographs, in the now-classic style of John Fielder and William Henry Jackson.
- Highlight the work of local artisans, each inspired by a ditch or reservoir near their home.
- Share a series of personal anecdotes from the past 150 years, showing how water use has impacted individual lives.
- Use maps, diagrams, and timelines which unite places and events.
- Take a fresh, lighthearted look at so-called "dry" subjects such as water law using humor and visual appeal.

The back matter of the manuscript will include a artist biographies, a resource directory, a bibliography, and an index. A colorful painting of workers on the Silver Lake Ditch by Ann Luce on the cover will stand out on store shelves and catch the reader's eye. If the reader is familiar with literature about the American West, they will be further enticed with foreword by Patty Limerick, Historian and Director of the Center of the American West, titled *A Soft Spot for "Small": Why Little Ditches Have So Much More Charm than Big Ones*.

Markets

Digging the Old West will appeal to a wide audience. The market for the book includes not only those interested in Colorado or the history of the American West, but also anyone interested in the environment or the fine arts. The artistic and environmental aspects will appeal to women, who buy 78% of books sold. When they discover features similar to successful series like “How Stuff Works” and Jackson-Fielder collections, they are likely to share the book with the men in their lives, opening it into a niche of the market that is often difficult to please.

Readers of all ages will enjoy reading about local history in this easy-to-read, visual format. While *Digging the Old West* will fit on multiple shelves in bookstores, it will also provide an invaluable resource for schools and libraries along the Front Range.

Rights

The Colorado Department of Transportation (CDOT) will receive non-exclusive rights upon completion of the manuscript. Exclusive rights may be granted if CDOT agrees to publish the book for the general public. A publication and promotion proposal is detailed on page 7 of this proposal.

Subsidiary Rights

This manuscript is an extension of the Ditch Project, which originally took form as a museum exhibit at the Boulder Public Library and Dairy Center for the Arts. As a result, the book will be connected to the website Ditch Project’s website (DitchProject.org) which was designed by the author. A special section of the website will be created specifically for the book, in order to generate revenue and interest. Additionally, this book has the potential to become a television documentary.

Spin-offs

In creating a new style for an environmental history text, there is some potential for future books featuring the same style. Future topics could focus on transportation, mineral resources, and a city’s connection to the climate.

A Mission Statement

As a writer, I never expected to spend my time digging up the remains of abandoned dams or pouring over water law cases from the 19th century. Writers, so I thought, did not hunker down over antiquated maps, comparing townships and ranges to satellite photos. Then, I moved away from my home state of Colorado, only to return to a slew of new suburban development. When the initial shock and pain caused by change wore off, I slowly realized that the Western landscape has always been evolving, and necessarily so.

Many aspects of our lives depend on the dynamic aspects of our environment. I have learned how important it was to understand local history, especially if we have any hope for our future. As a result, I've devoted my time and writing to understanding the environmental history of our landscape, and helping others to do the same. The framework for this manuscript arose from that passion. Thus, in *Digging the Old West*, I aim to share my knowledge and love of the curious and wonderful land that I grew up on.

Publication and Promotion Plan

During the production of this manuscript, the author will use a modified version of this proposal to seek out publishing opportunities with literary agents and regional publishing houses. One copy of the text, complete with page layouts, will be presented to historians at CDOT. Once a suitable publisher is established, the author will work with CDOT and the publisher to arrange rights and permissions to publish 5,000 copies of the manuscript for a general audience. If a regional publisher cannot be found, the author may explore self-publishing options for distribution within CDOT and other local organizations.

To assist with communications with publishing companies, obtaining permissions from artists, and other clerical tasks, the author will hire a part-time assistant. The assistant, Mary Catherine de Marigny, a sophomore in Environmental Studies, is seeking a certificate from the Center of the American West at the University of Colorado at Boulder, and looks forward to working on this inter-disciplinary project.

Once published, the author is eager to work with the publishing house to promote the book, and will cooperate in any way possible, including giving talks, distributing press kits, and maintaining websites like the DitchProject.org.

Similar Works

Digging the Old West will be the first book to incorporate both art and science into the history of dam and ditch construction. However, there are a number of other titles on the market which compliment this subject. These include:

- *Cadillac Desert: The American West and Its Disappearing Water* by Marc Reisner. Penguin (Non-Classics); Revised edition, January, 1993. Reisner's look at the history and use of a precious natural resource, originally published in 1986, has grown to become one of the most important books of the environmental movement. The awareness raised by the book rivals Carson's *Silent Spring* and the works of Aldo Leopold. Unfortunately, this dense text lacks any illustrations to accompany the author's strong message.
- *Mayordomo: Chronicle of an Acequia in Northern New Mexico* by Stanley Crawford. University of New Mexico Press, July, 1993. While many books about water talk feature large projects or places like the Grand Canyon or the Hoover Dam, Crawford's book features a single life in the year of a small ditch, and the communities that bring it together. *Mayordomo* explains many aspects of ditch construction and maintenance, but with a narrow focus that fails to include larger canals or reservoirs.
- *A New Era for Irrigation* by the Committee on the Future of Irrigation in the Face of Competing Demands and the National Research Council. National Academies Press, October 22, 1996. Irrigation in the west may have a complex and fascinating history, but the future is likely to be even more tumultuous. This book serves as an excellent guide for resource managers and environmentalists; however the authors did not direct the book at a general audience.
- *Colorado's Water: Science & Management, History & Politics* by Neil S. Grigg. Aquamedia Publishing Company, September 2003. Published during a heavy drought, Colorado's educators have come to rely on Grigg's guide to water management. While the book does include illustrations and diagrams, it serves more as a textbook than a coffee table book.

Resources Needed

Completion of the book will require the following expenses:

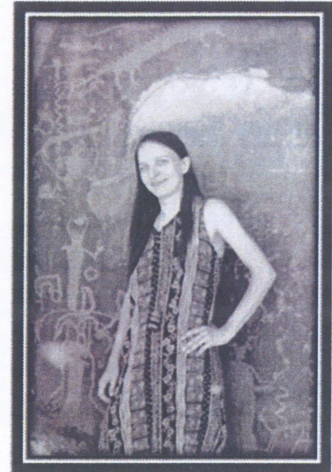
Item	Description	Total
Research	25 hours @ \$40 per hour	\$1000
Writing	100 hours @ \$40 per hour	\$4000
Layout	250 pages @ \$10 ea	\$2500
Photography	50 digital photographs	\$1500
Diagrams and Maps	50 illustrations; production and/or permissions	\$1000
Permissions	40 historical photographs and 30 Paintings	\$2000
Clerical Assistance	for obtaining permissions and contacting publishers	\$1000
TOTAL		\$13000

The manuscript will be ready for publishing by April, 2010.

About the Author

Karmen Lee Franklin is a Colorado native, raised on a suburban offshoot of the historic Church Ranch. After starting a family of her own, Karmen returned to college to pursue a Bachelor's degree in Environmental Studies at the University of Colorado at Boulder. She currently lives outside of Boulder with her husband and son.

A junior with strong academic standing, she is also working towards a certificate from the Center of the American West, where she receives mentorship from directors historian Patty Limerick and law professor Charles Wilkinson. While researching local history, Karmen has worked with various notable figures, such as the Honorable Justice Gregory Hobbs of the Colorado Supreme Court and Bob Crifasi, Director of Natural Resources for the City and County of Boulder Parks and Open Space.



In 2009, Karmen was honored to receive two Thompson Awards for Western American Writing. The first was in poetry, for the poem titled *Chief Niwot Said It First*, and the second for the novella, *Ashes of Meadow*. A short story, *Illusions in Lavender*, was published in an anthology titled *The Open Laboratory: The Best Writing on Science Blogs 2006*, edited by Bora Zivkovic.

Karmen began writing an online column for Seed Media Group in 2006. This column, titled "Chaotic Utopia", was featured on ScienceBlogs.com. Chaotic Utopia focused not only on environmental history, but also aspects of science and philosophy concerned with time and causation. One unusual but popular form of these blogs was the fractal. Between 2005 and 2008, Karmen produced over 50 fractal art pieces, most of which imitated some aspect of nature. A series of Karmen's fractals, each with an environmental theme, will appear in an upcoming series of high school science textbooks, titled BSCS *Science: An Inquiry Approach*. The blog was published regularly through January of 2008, when she took a temporary leave to complete her first full-length work of fiction.

She continues working on that novel, tentatively titled *Coffins and Churches*, which incorporates many of the same themes that will be addressed in *Digging the Old West*. She hopes the two books will complement one another, while reaching out to different markets. When not studying local history or writing, Karmen enjoys Xeriscaping and creating art, including fractals, photography, and folk art sculptures.

Outline

List of Chapters

PART I: The Old West	8
Chapter 1: How to Build a River Basin	8
Chapter 2: Native Life on the Plains	8
Chapter 3: The Early Explorers	9
Chapter 4: Eureka! The Gold Rush	9
PART II: Digging Ditches	10
Chapter 5: How to Build a Ditch	10
Chapter 6: Taming the Great American Desert	10
Chapter 7: Towns and Homesteads	11
Chapter 8: The Centennial State	11
PART III: Digging Dams	12
Chapter 9: How to Build a Dam	12
Chapter 10: Water is Big Business	12
Chapter 11: Crossing the Divide	13
Chapter 12: The Dust Bowl	14
PART IV: The New West	14
Chapter 13: How to Build a Metropolis	14
Chapter 14: A Constructed Ecosystem	15
Chapter 15: Water in the 21st Century	15
Chapter 16: The Future of Western Water	16

PART I: The Old West

The opening page of this part includes a timeline beginning with the relatively recent uplift of the Rocky Mountains, 70 million years ago, and ending with the Pikes Peak Gold Rush in 1859.

Chapter 1: How to Build a River Basin

17 pages, 11 illustrations

The book begins with a classic dilemma: change is inevitable, yet we tend to fear change. The typical story: kids grow up and move away from home. A few months or years pass by, until they return home for a visit (or worse, to move back in) only to discover that “home” has changed. The typical reaction: an upset adult child, demanding to know, “What did they do to this place?”

There is hope. This aversion to development can often be cured with a good look around. The opening section is an invitation to look around the surrounding landscape to see the changes in action. This will encourage readers to seek signs of a constructed landscape. They might be surprised. That swampy ditch on the hill might turn out to be an important source of drinking water. The pretty little lake over yonder may be keeping the power on. This is followed by the importance of water management, highlighting the subtle differences between the densely populated (and sufficiently damp) East coast and the semi-arid to arid West. Here, photographic art by Ken Sanville offers visual examples of hidden, treasured scenes along ditches in Boulder, Colorado.

Next, the chapter describes the evolution of the Colorado Piedmont, which lies between the High Plains and the Rocky Mountains. This includes a simple, colorful look at the geologic history of the region, including sedimentary layers, uplift, and erosion. It also explains why the South Platte River and many of its tributaries run from south to north, rather than from west to east, as rivers do on the rest of the plains. Visual features, such as a diagram showing the anatomy of a river basin and a sidebar featuring details about the South Platte River, will entertain readers as well as inform.

This is followed by a look at the last ice age, including the changing climate and ecosystem. A short section looks at the pre-settlement ecology of the river basin, beginning with the extinction of the North American megafauna and ending with the bison herds and wetlands which supported early human populations. A sidebar in this section questions the existence of trees along the prehistoric Front Range, showing the conflicts that arise from limited data. A painting of a heron by Elizabeth Jenny brings softness and warmth to the chapter, while showing an example of a riparian wetland. The chapter closes, setting the stage for the first human settlers in North America.

Chapter 2: Native Life on the Plains

14 Pages, 7 illustrations

The chapter focuses on the prehistoric use of water by humans living on the Great Plains. It begins with the nomadic lifestyle of early hunter-gatherers, focusing on the importance of water. While the

Native Americans followed herds of bison, they always needed to camp near a water source. As a result, many of the first human-made trails followed the courses of streams and rivers.

Eventually, a few tribes find the means to stop wandering the desert. They build the Ancestral Puebloan ruins at Mesa Verde. The section will feature the work of Ken and Ruth Wright, water engineers who discovered a system of canals and reservoirs at Mesa Verde. Photographs and illustrations of the ruins show the ancient city both as it once was and as it stands today. A sidebar here explains the clever construction of the cistern at Mug House in Mesa Verde, which collected water from the top of a wide, flat mesa. The water poured through a notch at the edge of the mesa and into the sealed cistern, providing a reliable source of water in desert-like conditions.

The closing section of the chapter shows that, like us, ancient peoples were not always prepared for change. A period of extended drought may have led to the destruction of the Puebloan culture and the abandonment of Mesa Verde. Not long after, the behavior and range of the nomadic tribes began to change as well, as horses introduced by distant Spanish settlers made their way onto the Great Plains.

Chapter 3: The Early Explorers

16 Pages, 10 Photos

When the famous explorers, such as Pike and Long, arrived on the Great Plains, they were quite unimpressed. Pike named the area the "Great American Desert". The semi-arid landscape didn't seem very hospitable, but the explorers continued on. The first section of the chapter looks at these early expeditions with a series of period maps. *Arrowhead*, a botanical painting by artist Cha Cha, also featured in this section, shows the sort of flora encountered and cataloged by the explorers.

The following section looks at the changes in wetlands caused by the construction of log cabins and the beaver pelt trade. A sidebar shows the beaver's role as a keystone species in wetlands. Pictures of beaver dams along Big Dry Creek in Westminster accompany the section, showing the ecological remnants of the past that live along the Front Range today. Next, Spanish settlers in the San Luis Valley develop systems of *acequias*, systems of ditches which fed early settlements. This section features photographs and stories of the San Luis People's Ditch, which holds the oldest water rights in Colorado.

Chapter 4: Eureka! The Gold Rush

12 pages, 8 illustrations

As the chapter title suggests, here the Gold Rush begins, bringing a new wave of pioneers to the region. Placer miners, panning for gold along the creeks, eventually dug ditches, leading to struggles over the water supply. Their solution, essentially saying "first come, first served" would later become the foundation for water law in the West.

With pioneers flocking to the area to look for gold, boom towns began appearing across the Front Range. The next section highlights some of their struggles, along with excerpts from pioneer diaries. These anecdotes, accompanied by newspaper clippings from the late 1850's, offer a first-hand look at

Colorado's early days. The focus here is not only on water, but the agricultural goods that needed to be shipped at great cost from eastern cities.

The chapter closes showing that these boom towns were not necessarily limited by the amount of gold to be found, but by the potential for irrigation. As more and more settlers arrived from the east, the demand rose for locally produced food. Without sufficient levels of precipitation, the Front Range began looking towards an effective solution: the ditch. A sidebar in this section shows then and now pictures of boom towns. In addition this and the photos and clippings mentioned above, the chapter will also feature abstract paintings of water by Kevin Kransoff.

PART II: Digging Ditches

The opening timeline for this section starts in the year 1859 and ends in the year 1900.

Chapter 5: How to Build a Ditch

15 pages, 12 illustrations

Here begins the earnest development of the old west, as networks of ditches were dug across the Front Range. The chapter focuses on several of these projects, along with diagrams explaining the "Anatomy of a Ditch". This includes the basic engineering aspects of ditches, along with the roles of workers and users in the community. This section includes the profiles of several ditch riders, men who managed and maintained ditches over the course of several decades. These portfolios are accompanied by black-and-white photographs taken by Stephen Collector.

Ditches featured in this section include the Wellman Ditch, one of the earliest ditches dug in Boulder County and the Farmer's Ditch, which holds the oldest water rights in Boulder County. The important distinction between the rights of the two ditches will become apparent in an upcoming chapter. Also featured is the Reno-Juchem Ditch, a ditch dug by early pioneers in Arvada. Artwork in this chapter includes then and now images of early ditches, historical advertisements for ditch digging equipment, and photographs of Bruce Campbell's painted headgates, which show a unique and artful twist on old ditch essentials.

Chapter 6: Taming the Great American Desert

17 pages, 13 illustrations

Using the stories of farmers who maintained ditches in the 19th century, the chapter begins by showing the challenges of living off a semi-arid landscape. This includes a look at the climactic cycles producing long droughts, and the false assumption carried by early farmers that "the rain follows the plow."

A special focus on historic settlements such as the Church Ranch and the Savery Mushroom Farm includes then and now pictures and images of restored buildings. A painting by Teri Gortmaker titled *Bear Creek Feedin' Time* shows life on the ranch as it once was and still is today.

The next section focuses on the impacts of ditches on ecosystem and the creation of wetlands on and below ditches. Colorful diagrams show the different plant communities that live above and below a ditch. A final section focuses on the Hayden Survey, sponsored by the U.S. Geological Survey, which took a detailed look at Colorado's natural resources. This includes a series of maps showing watersheds and mineral belts, as well as a triangulation map revealing the methods used by Hayden and his mapmakers to report such precise details to the government back east.

Chapter 7: Towns and Homesteads

14 pages, 9 illustrations

Here, readers learn that ditches were important not only to farmers and ranchers, but to the homes, businesses, and industries of western towns. Most communities developed first along the river banks, then expanded outward along the network of ditches. The ditches passed through front yards of homes, providing drinking water. Early in the chapter, a map of Boulder County from 1888 shows the details of various towns, as well as homesteaders and landowners. Sections of this map will be enlarged and compared with the pioneer stories later in the chapter.

Early homesteaders often made claim to piece of land, only to discover someone else owned the water flowing through it, and someone else still owned the minerals beneath the land. The next section looks at various uses of resources and the industries created around them. These industries supported the small towns along the Front Range. As an example of this, a sidebar looks at coal mining in the towns of Marshall, Louisville, and Lafayette.

The final section of the chapter examines the network of ditches which sprung around these towns and mines, including the Marshallville Ditch, the Goodhue Ditches, the Anderson Ditch, and the Davidson Ditch. The section will focus on the stories of these early ditches, along with then and now pictures, and artistic impressions such as Buff Elting's birds-eye-view paintings and Carrie Malde's impressions of the Davidson Ditch.

Chapter 8: The Centennial State

15 pages, 9 illustrations

The demand for water in the Old West was so great that by the time Colorado became a state, most of the waters had already been claimed by some farmer or another. Before then, territorial courts had their hands full trying to straighten out disputes over ditches. Most of the chapter focuses on the lively case of Coffin versus the Left Hand Ditch Company, which ended up setting a precedent for nearly all Western water law. Far from being a dry court case, the Coffin scandal began during a long drought, when Rueben Coffin and his neighbors took up shovels and other implements of destruction and destroyed a small diversion deep in the Rockies. This section (parts of which can be previewed in the

“Sample Selections” section following this outline) includes charts and maps explaining the incident, biographies of the parties involved, and the final verdict.

The closing section of the chapter looks at Colorado’s landscape as it was at the time of statehood. Maps (Plats) of water districts 5, 6 and 7 show the network of ditches that covered the Front Range at the time. The chapter will end leaving the reader to ponder what might be missing on these turn-of-the-20th-century maps: the lakes. As a final bonus for this chapter, Mary Hey’s painting, *Heart of the City*, shows a Colorado ditch as a peaceful and nearly timeless scene.

PART III: Digging Dams

The opening timeline for this section starts in the year 1900 and ends in the year 2000.

Chapter 9: How to Build a Dam

12 pages, 10 illustrations

The first chapter in this part discusses the impacts of electricity on an already changing landscape. With new improvements in technology, ditch owners could measure the amount of water passing through their ditches, and even better, store it for when it might be needed most. The initial section of the chapter will focus on the need for measurement and storage. A 1907 map by the Eastern Colorado Power Company shows the newly constructed reservoirs of Boulder County, as well as proposed developments—many of which were eventually built. Next, a series of diagrams show how measurement devices work, as well as the basic construction of a reservoir. Artistic photographs of gage houses by Bob Crifasi accompany another painting by Teri Gortmaker show that these devices can be as aesthetic as well as functional.

The next section will focus on the construction of a particular reservoir, Standley Lake. Standley Lake provides an interesting example, having been two smaller lakes to begin with, one natural and the other constructed by an early settler. Big dreams led to big plans for the reservoir and its key dam, and as it turns out, big disasters. The earthen dam collapsed shortly after it was finished. This section documents the dam from planning stages to the repairs of the damage with then and now pictures, and a look at the Farmers Highline Canal which fills the lake, even today.

Chapter 10: Water is Big Business

16 pages, 13 illustrations

The chapter continues the story of the Farmer’s Highline Canal by focusing on the company which created it. In the early 20th century, groups of farmers began to realize it was more effective to pool their resources and build large canals and ditches to provide water for large projects. The sections in this chapter introduce the two largest of these corporations, the Farmer’s Reservoir and Irrigation Company (FRICO) and the Colorado-Big Thompson Project. Maps and photographs show the lakes and ditches that compromise these systems. Locations include the Community Ditch and the Croke Canal. The section

includes Michael McCrea's artistic photo, *Community Ditch from Marshall Reservoir* and James Pedersen's series of paintings on the Community Ditch.

Next, the chapter introduces the Silver Lake Ditch. The builders of the ditch arrived too late in the game to get water rights down on the plains, and so constructed an elaborate system of aqueducts to bring water down from a lake near the Arapaho Glacier. The next owners of the ditch tried to use the water to design a subdivision called Wellington Gardens. A large ad for the development shows the high hopes and aspirations of the planners. Unfortunately, there was not enough water to deliver, so the plan was a bust.

The chapter concludes showing the increased capacity for water storage, and the need for new sources of water to fill the reservoirs. A sidebar in this section describes the creation of the US Bureau of Reclamation, hinting at larger scale projects to come.

Chapter 11: Crossing the Divide

16 pages, 14 illustrations

As the demand for water continued to increase, engineers began looking at one of the richest sources of water in the west: the Colorado River Basin. The chapter begins with a look at the Grand Canal, the first project to move water from the western to the eastern slope of the Rockies. Next, the chapter turns to the story of George H. Church and his son John Frank Church, who constructed one of the largest ditches in between Boulder and Denver, multiple reservoirs, and finally a small tunnel across Berthoud Pass. This diversion brought water from the Fraser River (a tributary of the Colorado), into Clear Creek, and finally delivered to the Church Ditch.

The following section discusses the growing demand for municipal water. This includes a look at Denver Water, focusing on the construction of the Moffat Tunnel and Gross Reservoir. A sidebar shows the history of Denver Water, from private business to municipal utility. Next, the Colorado-Big Thompson Project returns, which introduces the largest of transcontinental diversions. Diagrams and photos show the construction of the Alva B. Adams tunnel, which delivers water into the Big Thompson River.

Coloradans weren't the only parties interested in the Colorado River water. The closing section of the chapter discusses the 1922 Colorado River Compact, and the agreements between seven states to divide up the river's supply. Original documents used during the agreements feature prominently in this section, including charts showing the amounts of water discussed and a map showing Colorado as the headwaters state. Blown-up sections of the map show several planned reservoirs along the Colorado River, including the Glen Canyon and Hoover Dams.

Chapter 12: The Dust Bowl

15 pages, 12 illustrations

With all of the reservoirs, canals, and transcontinental water diversions, the drought of the 1930's still hit the Front Range hard. The boost in supply was virtually useless without effective farming methods. The first section of the chapter describes the state of the landscape at the onset of the dust bowl. The overuse of wells and water storage left many farmers high and dry. A sidebar focuses on the ecological impacts of lakes, while anecdotes from farmers and families shows the impact of the drought on humanity.

In the next section, the Silver Lake Ditch comes back into focus, with a special feature on Ev Long, who bought the ditch in the early 1940's. This includes his biography and portrait, the methods used for repairing and lining the ditch with steel pipes, and a look at Ev's daughter who keeps his gardens and legacy alive today. Paintings by Anne Luce, one of which is featured on the cover of the book, show workers maintaining the Silver Lake Ditch.

Finally, the chapter looks at the technological solutions that helped farmers overcome the dust bowl, focusing on the use of central pivot irrigation. Satellite photos show the widespread use of the method as green circles dot the landscape, while then and now photos show the transformation of the agricultural landscape.

PART IV: The New West

The opening timeline for this section starts in the year 2000 and continues for several decades with planned events and predictions, mostly related to climate.

Chapter 13: How to Build a Metropolis

14 pages, 12 illustrations

As the 20th century progressed, a network of suburbs, highways, and freeways began to develop along the constructed backbone of ditches and lakes. Diagrams show the complicated ways water is managed in the Denver/Boulder region. A visit to a waste water treatment plant gives readers a chance to see what happens after they flush, without having to plug their noses. Actual copies of straight line diagrams used by Boulder and Denver show the way water commissioners look at a city's water supply.

The following section of the chapter looks at the development of cities like Denver and Boulder and the suburbs which surround them. The increase of pressure on municipal water supplies causes cities to buy up old water rights and convert irrigation systems into residential systems. Standley Lake features once again, as cities began to bicker over its vast supply. As residential communities like Westminster collide with industries like Rocky Flats, water quality issues come into play. Anecdotes and photos of a protest over poor water quality in the Kershaw Ditch highlight the struggles between suburban residents and city planners. Here, a sidebar shows the progression of the Clean Water Act and the cleanup of the South Platte River Basin.

Chapter 14: A Constructed Ecosystem

13 pages, 14 illustrations

The chapter, as suggested by the title, looks at human interactions with the ecosystem in suburban settings. The opening section looks at the role of city Open Space programs, including the benefits and challenges of maintaining a so-called “natural” environment. Wetlands, once thought of as swamps, become treasured spots for nature lovers. A network of bike trails graces the once utilitarian ditches. At the South Boulder Canyon Ditch, planners install a fish ladder to mimic a natural creek. Unfortunately, not everything is native in this restored landscape. The next section features the unstoppable growth of invasive species along on Open Space lands. A sidebar shows the conflicts between a community and open space managers, as homeowners, who claim to enjoy the “native” spaces, complain about dust from prairie dog colonies.

Preble’s Meadow Jumping mouse offers an example of a species endangered by suburban developments, while a study of the Ute Ladies’ Tresses shows how some species, like the delicate orchid, now thrive in irrigated fields. Throughout the chapter, photographs of wildlife and artwork show the beauty of Colorado’s open spaces. These include Ann-Marie Kuczun’s *East Boulder Ditch* series, landscapes by Elizabeth Black, and Wendy Rochman’s graceful painting of cottonwoods, titled *Winter Ditch Matriarchs*.

Chapter 15: Water in the 21st Century

14 pages, 13 illustrations

The detailed look at ditches in cities today continues with a look at agriculture and industry today. The chapter begins with a look at Xcel Energy, focusing on the Cherokee Power Plant (the largest in the area) and the Valmont Power Plant in Boulder. This includes a detailed photo diagram showing the way the Valmont plant uses ditch water. Maps and photographs show the system of ditches and canyons used to bring water to the plants, including profiles of the Dry Creek #2 Canal and the Legget Inlet in Boulder, and the Fisher Ditch in Denver. Artistic photographs by John Matlack show the Valmont plant in a new light.

Next, a section looks at 21st century agriculture, big and small, and the continued dependence on ditches. A recent ad shows the cost of obtaining water rights to water a private farm. In hopes of bypassing old water rights, consumers petition the government to allow rain barrels to collect water for maintaining lawns and suburban landscapes. The law passes, but with a caveat that the rain barrel owner must have rights to the ground water, so only well users can benefit. Then and now pictures accompany the section, showing the changing uses of water at home and on the farm, while a sidebar highlights a 21st century water fight between the cities of Lafayette and Boulder over the Anderson ditch.

The chapter closes with a look at the recreational uses of water today, including a special look at in-stream flows. Here, cities buy water rights in order to keep the water in the creeks and rivers for kayak

courses—overturning century old law which called for the water to be diverted away. Finally, a map-like diagram shows the amounts of water flowing through and out of Colorado in multiple river basins.

Chapter 16: The Future of Western Water

10 pages, 3 illustrations

This brief and final chapter looks at the future of Colorado's lakes and ditches. The first section looks at the potential impacts of climate change on the state's water supply. Gross Reservoir comes back into focus, as Denver proposes to raise the dam in coming years, greatly increasing the reservoir's capacity.

The following section looks at the disappearance of ditches across the landscape. While a few of these disappearing ditches were simply abandoned due to engineering failures or inadequate water rights, many other ditches are going underground, both for efficiency and safety. A sidebar looks at the danger of ditches with an anecdote from a family that nearly lost their child to the raging flow.

Finally, the chapter returns to the point at which the book began, with humanity's reaction to an ever-changing landscape. The book closes with a visual twist: A painting by Chuck Foresman, titled *Aaryn's Fort*, shows an alternative use for a winterized ditch, as homeless persons take shelter in a Silver Lake Ditch pipe. The readers are left to decide for themselves if this is an appropriate use of a ditch, just as they must decide how to feel about changes their own backyard.

Sample Selections

The following selections reflect the style and tone that will be used in *Digging the Old West*. As soon as the production of the book is underway, this section will be replaced with a sample chapter and page layouts to present to potential publishers. For now, two environmental history essays by the author are included: *Where the Bison Roamed* and *Coffin v. The Left Hand Ditch Company*. The contents the latter essay will be incorporated into the book in chapter 8. For additional examples of the author's style, please visit the following links, which lead to environmental history articles from Chaotic Utopia:

- **Taming the Great American Desert** (a 3-part series on the history of Church Ranch)
 - *Part One: Wedding Bells and Wagon Wheels:*
http://scienceblogs.com/chaoticutopia/2006/09/wedding_bells_and_wagon_wheels.php
 - *Part Two: Taming the Great American Desert:*
http://scienceblogs.com/chaoticutopia/2006/09/taming_the_great_american_dese.php
 - *Part Three: Seasons Change:*
http://scienceblogs.com/chaoticutopia/2006/10/seasons_change_development_on.php
- **Climate Change: Predicting Colorado's Future:**
http://scienceblogs.com/chaoticutopia/2008/01/climate_change_predicting_colo.php
- **Stone, Steam, and Sand: A Geologic Photo Tour of the Southwest**
 - *Part One:*
http://scienceblogs.com/chaoticutopia/2006/09/stone_steam_and_sand_a_geologi.php
 - *Part Two:*
http://scienceblogs.com/chaoticutopia/2006/09/stone_steam_and_sand_a_geologi.php
- **West from Westminster Hill, Then and Now:**
http://scienceblogs.com/chaoticutopia/2006/10/west_from_westminster_hill_the.php
- **Wandering West, Then and Now:**
http://scienceblogs.com/chaoticutopia/2006/07/wandering_west.php

Coffin v. the Left Hand Ditch Company

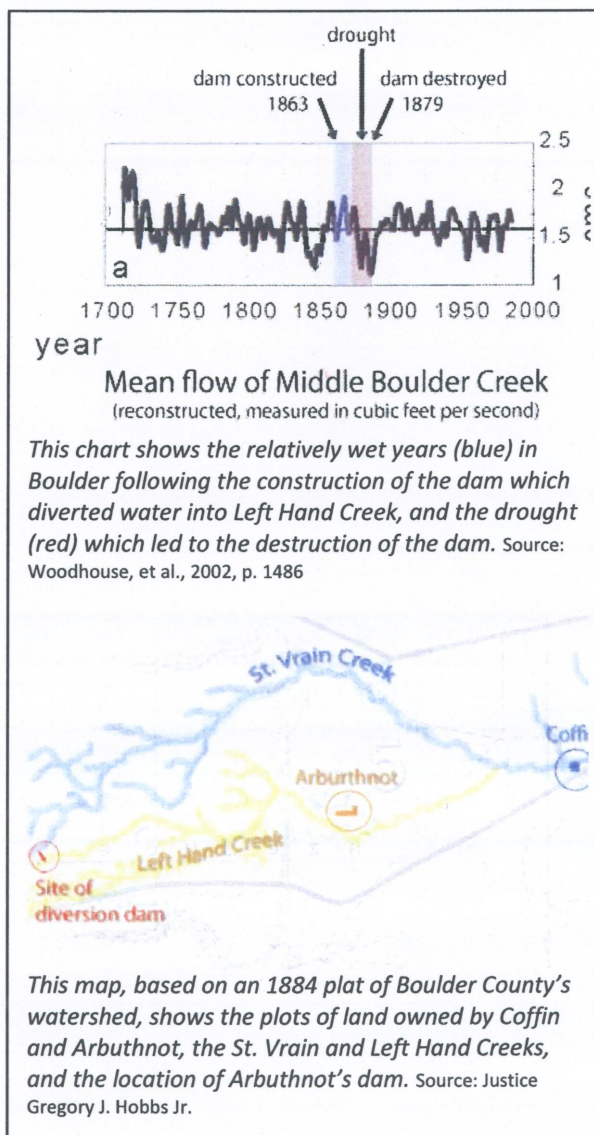
By Karmen Lee Franklin
2009

As suggested by the old western farmer's warning, "You can fool around with my wife, but not my water rights," (Dyni 2005) Coloradans often placed more value on water than marriage or gold. Shortly after Colorado reached statehood in 1876, droughts began to spark violent disputes. One such case, involving both civilian violence and the Colorado Supreme Court, set a precedent for water law which forever set the American West apart from the rest of the nation. Even today, western courts turn to the 130-year-old case, Coffin versus the Left Hand Ditch Company, when settling disputes over water.

The settlers who arrived in Boulder, Colorado from 1858 into the early 1870s established farms and ranches during a relatively wet decade, as the state recovered from one of the worst regional droughts in a century. (Woodhouse, et al, 2002, 1491) By 1879, however, that good fortune had dried up; Boulder's growing agricultural communities faced their first water shortage. By the time summer officially began, many creeks and streambeds in the infant state began to run dry, leaving too little water to go around. All around the state, newspaper editors cried out for water law reform, or clarification of the freshly written Constitution.

"As our country settles up, the water question becomes of more and more interest to the people. [...] What is to be done?" asked a letter to the editors of the Boulder County News in 1878. The message was urgent: "No farmer can live in Colorado without water." (Matthews, 1878, 1) A section of the state's constitution outlined a set of rules for irrigators, but to the average citizen, the law was contradictory and difficult to understand. As the drought of 1879 worsened, the question remained: how should water be distributed if there was not enough to go around? When the courts didn't intervene, some embittered farmers left the state. Others tried to take the law into their own hands.

One sunny June morning in 1879, Reuben Coffin awoke to discover a field of wilting corn. His farm sat near the confluence of Boulder Creek and the St. Vrain Creek, a prime location for riparian



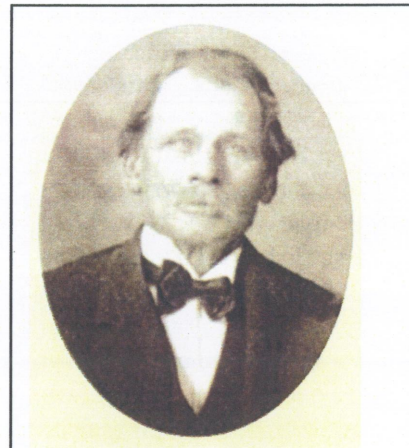
(creek-fed) irrigation. That morning, however, the St. Vrain Creek was as dry as a bone. Angered, Coffin didn't blame Heaven or Nature. Instead, he gathered a few of his neighbors and followed the dry bed some 30 miles upstream to the source of the problem: a dam on the creek.

Originally, Boulder farmers designed the structure to divert part of the St. Vrain Creek into the Left Hand Creek watershed. The earthen dam, built just beneath the Continental Divide, redirected the flow of the St. Vrain into a short ditch leading to nearby James Creek. Winding through a series of canyons, James Creek fed the diverted water into Left Hand Creek. Left Hand Creek meandered around Table Mountain, delivering the water to farms in the Boulder valley. The dam had been built by the Left Hand Ditch Company, a group of farmers living beneath Table Mountain. The company, consisting of Samuel Arbuthnot, Joe Jamison, the Hinman brothers, and founder Lorenzo Dwight, constructed the dam 16 years before the 1879 drought, when the St. Vrain Creek still ran strong.

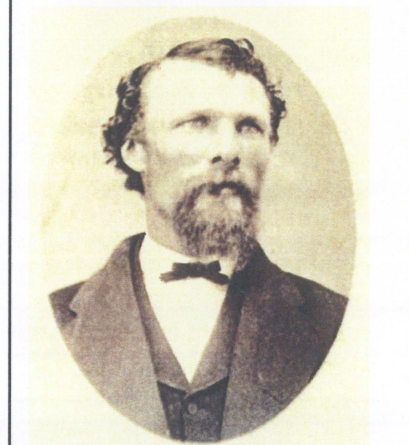
Coffin and his neighbors decided water belonged in what they considered the "natural" course of the creek, or, more importantly, watering their fields. They destroyed the dam by digging out the middle section, allowing water to return to the St. Vrain. (Abstracts, Coffin et al 1882, 18-19) Satisfied, the men returned to their farms to await the return of their water. Later that day, down on the Left Hand Creek, Samuel Arbuthnot and his neighbors noticed a greatly reduced flow of water dribbling onto their lands. Upon investigation, they discovered the damaged dam on the St. Vrain Creek, high in the mountains above. They promptly repaired the dam. Coffin, undeterred, dug it back out. After a few rounds of cat-and-mouse, dam-and-destroy, Arbuthnot and his friends decided to guard the diversionary dam with a gun. Coffin retaliated by taking the Left Hand Ditch Company to court.

Reuben Coffin grew up in Roxbury, New York (Roots Web 2008, 288) where water appropriation was based on riparian rights, a set of principles imported from Europe. According to the riparian code, the people living along the shores of a waterway had a right to use the water as needed, as long as they returned enough flow through groundwater discharge and surface drainage to sustain their neighbors downstream. Farmers from England, old and New, with naturally moist lands, gave little thought to water rights. (Schorr 2006, 319) Since most of the arable land in Colorado was nowhere near a creek, the majority of farmers demanded a more equitable solution. The state's constitution provided such a solution by replacing riparian law with public ownership.

The constitution, drafted in 1876, stated that "the water of every natural stream, not heretofore appropriated, within the State of Colorado, is hereby declared to be the property of the public [...] subject to appropriation." (Constitution of the State of Colorado 1876, sec 5) With this law in place, farmers need not own land adjacent to a creek or river to use the water. Everyone had an equal chance to claim the unused resource, as long as they got to it first. The constitution allowed users the right to



Samuel Arbuthnot



Reuben Coffin

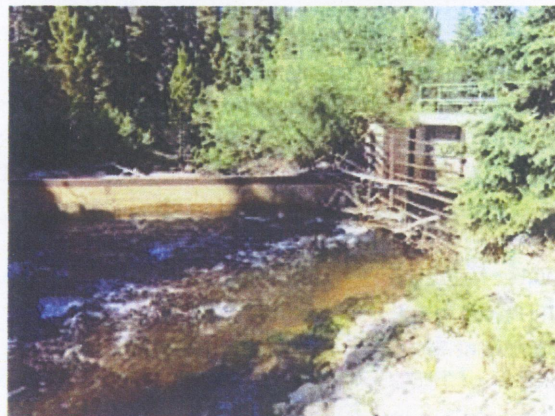
Source: Elizabeth Black

remove the water from its source and transport it across “public, private, or corporate lands” in “ditches, canals and flumes.” (Constitution of the State of Colorado 1876, sec 7) In these articles, the state of Colorado declared its public waters to be first come, first serve. Users would be allowed to put any bit of water to good use, as long as no one else claimed it. In the words of the constitution, “the right to *divert the unappropriated waters* of any natural stream to *beneficial uses* shall never be denied.” (Constitution of the State of Colorado 1876, sec 6, emphasis added.)

Colorado’s founders based these laws, not on arbitrary guesses or corporate bribes, but on territorial acts (laws passed before Colorado became a state) and dry practicality. One territorial act, created in 1861, declared that not only is a person “entitled to the use of the water” but is also “entitled to a right of way through the farms or tracts of land which lie between him and said stream.” (An Act to Protect and Regulate the Irrigation of Lands, 1861, sec 2) Another act, passed by the territory’s legislative assembly in February of 1864 (An Act to Enable Road, Ditch, Manufacturing and Other Companies to become Bodies Corporate 1864, sec 32) reinforced the concept of “first in time, first in right”, a code used by the first gold miners in Colorado at Gregory Gulch in 1859. (Schorr 2005, 16-17) The miners were not the first users of water in Colorado to set a tradition for the state constitution. Even earlier, in the Arkansas Valley in southern Colorado, descendants of Spanish settlers followed an old *acequias* tradition, in which all water belonged to the community, (Hicks 2004, 15) reflected in the public ownership mentioned in the state constitution.

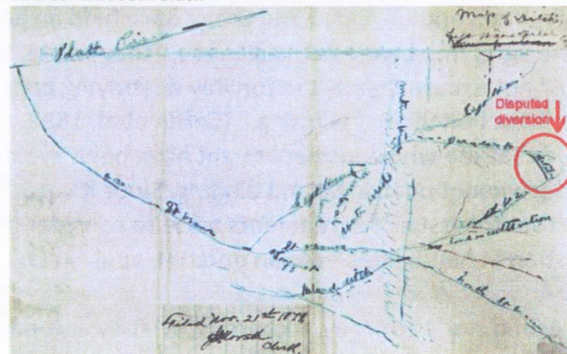
The constitution covered irrigation law thoroughly, but the interpretation was less than clear. Coffin’s case forced the courts to examine the law in detail, asking them to decide for the first time whether or not Colorado’s water was first come, first serve. If Reuben Coffin studied history and law, he might have seen the troubles ahead. Arbuthnot and the Left Hand Ditch Company could claim prior appropriation right, since they filed their claim to the ditch in 1869. (Abstracts, Coffin et al 1882, 31) On the other hand, if water was a public resource, it should be freely available to whoever needs it, such as those living along the shores of a creek. In that case, surely Coffin, who held a junior water right on the St. Vrain creek, would be allowed some share of the water.

Once decided, the case would become history. Coffin and the courts headed into uncharted territory with a new, multifaceted water doctrine, rather unlike the riparian doctrine of old. Coffin’s attorneys, emphasizing Coffin’s “beneficial use”, described the water of the St. Vrain Creek as natural and eternal source. They argued that the water “has flowed and when not diverted from its original



The headgate on the St. Vrain Creek, west of Ward, CO on the Peak to Peak highway.

Source: Elizabeth Black



A map used in the case, showing the diversion from St. Vrain Creek into James Creek.

Source: Flat Files. Coffin, et al.

channel, still does flow (sic) into, through and upon and across [Coffin's] land." That water, as the attorneys pointed out, "moistens and benefits [...] the crops of grass, grain, and vegetables growing thereupon and supplies the said Coffin with water for his stock and for domestic purposes." (Abstracts, Coffin et al 1882, 19-20)

While Coffin's lawyer used eloquent descriptions of nature to defend riparian rights, the Left Hand Ditch Company relied on history. The plaintiff's side began by calling Porter M. Hinman to the stand. "I am one of the original constructors of the ditch," he claimed. "I think there were 14 original constructors. The ditch was constructed to irrigate a few small patches of ground on Left Hand. [...] We had about 60 or 100 acres in cultivation." (Abstracts, Coffin et al 1882, p 31)

After Hinman detailed the construction of the ditch and the incorporation of the Left Hand Ditch Company, Coffin's lawyer cross-examined him. In the process, he suggested that the Left Hand Ditch Company once had a friendly association with Reuben Coffin. Hinman admitted the identity of the other constructors, including Coffin's neighbor and fellow defendant on the case, John Andrews. According to Hinman, another man, Porter R. Penrock Reuben Coffin's brother-in-law, also helped to build the dam. (Abstracts, Coffin et al 1882, pp. 32-33; Roots Web 2008, 288) What a dilemma. Did Coffin and his neighbors have some sort of relation to the dam they destroyed? No, John Andrews admitted on the stand. "I had an interest on the ditch," he said, "but I never done anything to it since." Without putting any water from the Left Hand Ditch Company's diversion to beneficial use, Coffin's party could not claim a firm right. On the other hand, the ditch company was unable to show they protected public property. The local and appellate courts were baffled. Motions were argued, overruled, and appealed, until December of 1881, when the case went to the Colorado Supreme Court to be decided once and for all.

The Supreme Court reviewed the appellate cases carefully, considering the possibility that the settlers on both the St. Vrain and the Left Hand Creek once held an agreement. "If the agreement were actually made," they wrote, "that fact would not excuse their act in forcibly destroying appellee's dam without notice or warning." (Coffin et al. 1882, 445) They noted that the whole incident might have been avoided had the agreement been legal and binding. Since it wasn't, the court set the issue of agreements aside to consider the major question at hand: does riparian doctrine apply in Colorado?

Arbuthnot's attorney, Richard H. Whitely argued otherwise. "Riparian rights exist only where agriculture is the product of the soil watered by natural causes," he said. "Our water system, being a substitute for nature, must be constructed, so far as agriculture is concerned, as free for all, subject only to prior right." (Abstracts, Coffin et al 1882, 18) The towns and farms of Boulder County, like other developing parts of the American West, were constructed landscapes. The "natural causes" that Whitely referred to—limited rainfall and snowmelt—could never support large populations of farmers, let alone tax-paying citizens who hired lawyers. The Supreme Court agreed with Whitely. Riparian water rights were not suitable for Colorado. "The climate is dry," they

"Houses have been built..., the soil has been cultivated, and thousands of acres have been rendered immensely valuable, with the understanding that appropriations of water would be protected."



Chief Justice Samuel Elbert
Colorado, 1882
Source: Colorado Historical Society, #X-15033

declared, "and the soil, when moistened only by the usual rainfall, is arid and unproductive; except in a few favored sections, artificial irrigation for agriculture is an absolute necessity." (Coffin et al. 1882, 446)

Acknowledging the climactic conditions and the value of water in the west, the court praised and predicted the entrepreneurial and engineering spirit of the American West. According to the court, led by Justice Samuel Elbert, the success and future of a civilized land depended on the protection of prior appropriation doctrine. They decided, "Vast expenditures of time and money have been made in reclaiming and fertilizing by irrigation portions of our unproductive territory." This effort made cultivation and development possible, but only "with the understanding that appropriations of water would be protected." (Coffin et al. 1882, 446)

The justices saw the amount of progress that had occurred in prior decades, and acknowledged the necessity of ditches and dams. Without some diversions of the water, the farms of the Front Range would have since blown into the dust. Furthermore, lacking agricultural support, the cities of Boulder, Denver, and Golden could not exist. A ditch, carrying water to where it was needed most, brought immeasurable value to the entire area. The riparian law, according to the court, was "inapplicable to Colorado." They concluded, "Imperative necessity [...] compels the recognition of another doctrine"—the Colorado doctrine, incorporating public ownership, prior appropriation, beneficial uses, and the right to divert waters. Furthermore, these aspects supported one another, according to the court. The first person to put the public supply of water to beneficial use had rights to that water. (Coffin et al. 1882, 447)

After examining the language in the 1861 and 1864 acts and the pertinent articles in the constitution, the Colorado Supreme Court formed a working model of the state's unique water doctrine. Citizens are entitled to use the water in their neighborhood, even to great distance, as long as they do not harm any previously existing beneficial use. The court found that the territorial act of 1864 which referred to users "who have a priority of right", neatly supported this. (Coffin et al. 1882, 451) Thus, the Supreme Court upheld Colorado's unique, multifaceted water doctrine. In the end, they declared the destruction of the dam was an "action of trespass" and found Coffin's claim to the water to be "insufficient." (Coffin et al. 1882, 451)

Over time, the Coffin vs. Left Hand case became known as the precedent for prior appropriation, even though the verdict was based on older decisions. The multifaceted doctrine determined by the Supreme Court, combining prior appropriation with public ownership, beneficial use, and right-of-way, spread to other parts of the West. Law expert Dale Gobel found echoes of the so-called Colorado Water Doctrine in Arizona, Idaho, Utah, and Wyoming. "Eventually," Gobel wrote, "all of the interior western states adopted the 'pure appropriation' or 'Colorado' doctrine." (Goble 2000, 157)

Over the years, many court cases and history books referred back to Coffin vs. Left Hand as the seminal case in prior appropriation. The verdict, confirming Colorado's multifaceted water doctrine, set the tone for nearly all water rights in the American West. As a result, the citizens of Colorado and other semi-arid lands could spread beyond the moist (and flood-prone) shores of temperamental creeks and rivers.

Sources: Coffin v. The Left Hand Ditch Company

- Abstract of Record. *Coffin et al. v. The Left Hand Ditch Company*. 1882. Case # 885, Colorado Supreme Court records at the Colorado State Archives.
- An Act to Protect and Regulate the Irrigation of Lands, 1861. *Colorado Territorial Laws*, section 2, 67-68. Denver.
- An Act to Enable Road, Ditch, Manufacturing and Other Companies to become Bodies Corporate. 1864. *Colorado Territorial Laws*, section 32.
- Coffin et al. v. The Left Hand Ditch Company*, 1882. 6. Colorado Supreme Court. 443-446.
- Constitution of the State of Colorado*, 1876, article XVI, sec 1-6. March 14. Denver: Tribune Book and Job Printing House.
- Dyni, Anne. 2005. *Pioneer Voices of Boulder County*. Boulder: Boulder County Open Space Department. Reprinted in "BASIN: The History of Irrigation in the Boulder Valley."
<http://bouldercommunity.net/basin/history/irrigation.html>
- Flat Files. *Coffin et al. v. The Left Hand Ditch Company*. 1882. Case # 885, Colorado Supreme Court records at the Colorado State Archives.
- Goble, Dale D. 2000. "Making the West Safe for the Prior Appropriation Doctrine." In *Law in the Western United States*. Edited by Gordon Morris Bakken. 153-159. Oklahoma: University of Oklahoma Press.
- Hicks, Gregory A. and Devon G. Pena. 2004. "*Sin aqua no hay vida: Colorado's Acequias—A Water Democracy.*" *Citizen's Guide to Colorado's Water Heritage*. Colorado Foundation for Water Education. 14-18.
- Matthews, L. 1878. Ditch Laws. *Boulder County News*, March 22, front page.
- McIntosh, Lemuel. 1888. *Plat of Water Districts Nos. 5 and 6*. Nov 30. Colorado: State Engineer's Office. Source: Justice Gregory J. Hobbs, Jr.
- Photos of Reuben Coffin, Samuel Arbuthnot, and Left Hand Headgates courtesy of Elizabeth Black.
- Portrait of Chief Justice Samuel Hitt Elbert. 1887-9. Colorado Historical Society. X-15033. Western History/Genealogy Dept., Denver Public Library.
- Schorr, David B. 2005. "Appropriation as Agrarianism: Distributive Justice in the Creation of Property" Rights. *Ecology Law Quarterly*. 32: 3-71.
- 2006. "The First Water-Privatization Debate: Colorado Water Corporations in the Gilded Age." *Ecology Law Quarterly*. 33: 313-361.
- Roots Web. 2008. "Descendants of Isaac Coffin: 288. Reuben Fryer Coffin."
<http://freepages.genealogy.rootsweb.ancestry.com/~mycoffinroots/Tree/d1.htm#i3273>
- Woodhouse, Connie A., Jeffrey J. Lukas and Peter M. Brown. "Drought in the Western Great Plains, 1845-56: Impacts and Implications." *American Meteorological Society*. October 2002. p. 1485-1493.

Where the Bison Roamed

By Karmen Lee Franklin
2008

Oh give me a home, where the buffalo roam.
"The Western Home" by Brewster Higley

Wild bison, wandering across open space, are an icon of the American West. Yet, after centuries of ecological change and human involvement, the bison, both as a population and a species, have suffered distinctive setbacks. http://scienceblogs.com/chaoticutopia/2008/10/buffalo_bills_defunct.php The great herds once covered the plains, shaping the prairie in their nomadic graze. Between 1820 and 1890, however, the bison were hunted to the point of near extinction. This happened for many reasons, yet it is only a footnote in historical texts. Looking closely at these texts, both fiction and non-fiction, presents a striking, dark history of the mass death of bison. The loss of the bison was both vicarious and mysterious, as is shown in historical literature, both in the fictional western novel *Blood Meridian: Or, The Evening Redness in the West* by Cormac McCarthy and actual pioneer memoirs. These accounts suggest the majority of bison were slaughtered in a nonchalant, yet rapid manner. In the end, few herds escaped. In Yellowstone, a small herd roamed unnoticed, while a few other herds were taken up by cattle ranchers. The bison adopted by ranchers were bred with cattle in hopes of making cattle stronger, smarter, and more disease resistant. Instead of improving the cattle, the experiments compromised the genetic integrity of the bison. Eventually, efforts to restore bison populations were successful—to a degree.

The bison were a keystone species, holding the ecology of the plains in a state of equilibrium. They roamed the plains for some 200,000 years before the first European explorers arrived. Before the *Bison bison* (the ones affectionately called the American Buffalo,) there were bigger bison (*Bison antiquus*) and before them, there were woolly mammoths (*Mammuthus primigenius*). With each succession of big game, humans, who used fire and built tools, arrived to kill them. Eventually, the larger mammals *Mammuthus primigenius* and *Bison antiquus* went extinct. The smaller *Bison bison* evolved to take their place. The Native Americans who lived on the plains for the majority of the past 12,000 years depended on the large mammals for survival, using them as a primary source of materials and food. By 4000 B.C., most cultures living on the Great Plains centered around the bison. Hides were used as clothing and shelter; bones were used as weapons, tools, and farming implements. It may have been the healthiest lifestyle on earth at the time, at least nutritionally, if height is a judge of health-- Plains Indians stood several centimeters taller than European settlers (Steckel, 554.)

Bison provided food and supplies for nomadic tribes and agricultural settlements, alike. (For instance, a bison scapula, attached to a long stick, made a handy hoe for tilling tough, clay-thick prairie soils.) Interestingly, the vast open prairie of the Great Plains may not have actually existed when the first humans began arriving in North America. During the Pleistocene, woodlands were common along the Great Plains, with hardwoods like oak and poplars to east, and pine forests to the west (Wishart, 635.) No one is certain what caused the trees to be replaced by grasslands, although climate change, human interactions through the use of fire, and changing distributions of bison migration patterns have all been implicated. It is rather doubtful that the humans alive at the time knew any better. Why waste time wondering about the role of fire in the dynamic equilibriums of an ecosystem, when you're using all your energy just trying to stay warm and fed? Regardless of motivation, if humans were involved in the

development of the prehistoric Great Plains, then the landscape encountered by European explorers in the 18th and 19th century should not have been considered natural. Landscape painter and architect Philip Juras wrote about this complex interplay between human and landscape in his master's thesis on pre-settlement North American savannas:

"It is recognized that Indians may have been the major cause of fire, though in some cases fire from lightning may have been responsible for maintaining an open landscape. If one considers that by burning, humans were probably the most important agent in shaping the structure and composition of the presettlement landscape, then it might be appropriate to argue that any restoration of such a landscape would, in fact, be a demonstration of a cultural landscape, more so than of a "natural" one. In a way, this aspect of the presettlement condition brings the often diametrically opposed views of culture and nature closer together." (Juras, ch. VIII.)

Change happened--this much we know--but what caused these changes remains an enigma. The bison themselves may be the ones to tell the true story. Their teeth recorded millennia of changes in climate, through the different grasses they chewed (Stricherz). Different types of plants leave different ratios of carbon in tooth enamel. So, by carbon-dating the enamel on bison teeth, paleontologists can determine what herbivore diets and habitats were like thousands of years ago. In any case, with the end of the Pleistocene, the climate of the Great Plains warmed and trees disappeared from the prairie landscape, except along the shores of creeks and rivers, also known as riparian corridors.

When explorers and pioneers of European descent arrived on the plains, some 12,000 years after those early hunters, survival still took priority over ecology. This was a dark period in time, as is illustrated in the violent, yet widely acclaimed novel, *Blood Meridian*. The story took place as the frontier along the Great Plains came to a close in the mid 19th century. Near the end of the novel, there is a gap in time in the narrative, between the 1850s, when the kid rode with the infamous scalp-hunting Glanton gang, and the 1870s, when he, traveling alone, met a bison hunter. Throughout the course of the novel, the gang wrecked havoc across a lawless and unfenced landscape. By the time the kid encountered the hunter, however, the landscape had already changed; the bison were gone. This gap represents a historical discontinuity, echoing the dark disappearance of the bison herds. While the bison are never seen in the novel, McCarthy's description of their mass slaughter, told in a single, long sentence, suggests that it happened quite rapidly:

"It was an old hunter in camp and the hunter shared tobacco with him and told him of the buffalo and the stands he'd made against them, laid up in a sag on some rise with the dead animals scattered over the grounds and the heard beginning to mill and the riflebarrel so hot the wiping patches sizzled in the bore and the animals by the thousands and tens of thousands and the hides pegged out over actual square miles of ground and the teams of skinners spelling one another around the clock and the shooting and shooting weeks and months till the bore shot slick and stock shot lose at the tang and hundred ton and the meat rotting on the ground and the air whirling with



flies and the buzzards and ravens and the night of a horror of snarling and feeding with the wolves half crazed and wallowing in the carrion" (316-7.)

Without a pause, this lengthy, yet vivid description suggests the drive to kill the bison was an unstoppable force, where the hunters had no time to consider the impacts of their deeds in between shots. The results, on the other hand, are given described in a concise and simple manner. "They're gone," the buffalo hunter tells the kid. "Ever one of them that God ever made is gone as if they'd never been at all." In the following scene, the kid witnessed the aftermath of the destruction with his own eyes, as he encountered fields of bones, stalked by packs of wolves and "bonepickers," groups of men and even families who were collecting the bones in overflowing carts.

One does not need to turn solely to fiction to find the loss of the bison. When pioneer Sarah Church and her husband were driving their first load of cattle to their settlement on the plains of Colorado in 1862, she expected to see herds of bison along the way. But she didn't. "We wished so much to see the great herds of Buffalo we had read of, but only saw one half grown and partly domesticated," she wrote. (Church, 13) It wasn't as if they were traveling through an area unsuitable for bison. Sarah recalled that as they set out on their first trip west, some traveler had suggested they use dried bison chips to fuel their campfires. The dung was common... but what happened to the herds?

Sarah Church would have realized what happened to the bison, eventually. Her husband was friends with one of the most famous of the bison killers of all time, "Buffalo Bill" Cody (shown, right.) According to the foreword of his autobiography, Cody killed 4,280 bison in a period of only 18 months. (*The Adventures of Buffalo Bill Cody*, pg ix.) Despite his namesake, Cody was among those who first realized the bison, as a species, were in danger. By that time, he was more of a showman than a bison killer. Unfortunately, the American government decided it would be in its best interests to let the bison go extinct.



The railroad companies, expanding west, encouraged the mass slaughter of bison. Herds of bison wouldn't move out of the path of an oncoming locomotive, which would be unable to stop in time. So, to clear the railways, men would shoot at the bison from the train as it flew past. The railroads hired sharpshooters to seek out the herds as well. These practiced gunmen knew how to sneak up on a herd and start shooting rapidly, so hundreds of animals would die before the rest realized what was happening and began to stampede.

Not only did the bison herds threaten to harm railroads and compete with cattle ranchers, but they were the pride of the government's perceived enemy: the "dangerous native savages". So, in hopes of forcing the native populations into European lifestyles, conservation efforts were intentionally suppressed:

"The civilization of the Indian is impossible while the buffalo remains upon the plains," declared secretary of the interior Columbus Delano in 1873. Two years later, Gen. Philip Sheridan told a joint session of Congress that buffalo hunters had done more to settle what he called "the vexed Indian question" than the entire U.S. army. Sheridan urged the politicians to continue to support the hunters. "For the sake of lasting peace," he said, "let them kill, skin and sell until the buffaloes are exterminated." (Geist, 69.)

The results were successful, or tragic, depending on your point of view. By the 1880's, the bison were nearly extinct, with only a few individual herds surviving, Native Americans on plains reservations were forced to use cattle in mock bison hunts. The few remaining herds were fenced in, along with the rest of the plains.

The fencing of the American West and the slaughter of the bison, both of which allowed for the agricultural development of the plains, seem to be inextricably linked. The epilogue of *Blood Meridian*, which closely follows the kid's encounters with the buffalo hunter and bonepickers, may not only encompass the ending of the novel, but the end of open space in the American West. It describes a man "progressing over the plain" using a two-handled "implement" to create a series of holes, as well as other figures that follow him, including "the wanderers in search of bones" and "those who do not search" (McCarthy, 319.) Professor Jay Ellis suggested the epilogue was referring both to the loss of bison and the fencing of the land. He argued that the first figure represented a man digging holes for fence posts, while the second figures were the bison bonepickers, and the final group represented surveyors. "As for fencing, the meridian of the American West—in the sense of its division by fencing—occurred too chronologically close to the killing off of most of the American bison not to associate the two actions" (Ellis, 92.)

By the turn of the 20th century, the free-roaming herds of bison were a thing of the past. However, they continued to symbolize the west, appearing as mascots or patriotic song. A photograph (shown, right) of "Charlford", a fancy manor house south of Denver, shows the importance of bison as a symbol of pride to the residents, even though the animals had long since been removed from the landscape. The photograph was taken sometime after the mansion was built in 1926. The artist wanted to depict the plains surrounding the house as they once were, and so glued a few bison right into the photograph.



This story isn't altogether tragic. The bison did eventually make something of a comeback. There were approximately 500,000 bison alive during the last extensive survey in 2006 (Sanderson, et al. 246.) Most are raised in private herds for consumption, although about 10,000 roam wild in national parks, like Yellowstone. Yet, without their original range, the bison have been unable to regain their role as a keystone species in the plains ecosystem. Cattle, or even fenced bison, make a poor replacement. They tend to overgraze, which leads to erosion, causing excess amounts of sediment to flow into the rivers. Other species which once followed herds of bison have now settled permanently in the suburbs, often with a negative impact. For instance, the cowbird, an obligate brood parasite (it lays its eggs in the nests

of other songbirds, who unwittingly raise the baby cowbird as their own while neglecting their own young) no longer migrates, so the effects of its parasitism are not spread out, but localized.

Perhaps most bizarre is not the loss of the bison to their individual ecosystems, but the loss of identity of the bison themselves. Recent studies have shown that most bison living today carry a small number of cattle genes in their DNA (Halbert and Derr, 8.) In the 18th century, ranchers hybridized cattle and bison, creating beefalo and cattalo. They hoped to take the disease resistance, intelligence, and hardiness of the bison and spread it to the population of cattle. Instead, they ended up spreading cattle genes into the bison population.

Dr. James Derr of the Texas A&M College of Veterinary Medicine has discovered cattle genes in all but a few herds of bison. Particularly, the herds in Yellowstone and Wind Cave National Parks, along with a herd owned by the state of Utah, and a herd owned by Ted Turner, have so far shown no genetic evidence of hybridization. In these cases, fences may actually save the uniqueness of the bison. Dr. Derr emphasized this in his closing remarks at the talk on "the Ecological Future of North American Bison" in Denver, Colorado, in 2006:



"Given all of this, for bison or any other species, for long-term conservation, one major consideration must be the preservation of their germplasm. If this germplasm is lost through extinction, genetic drift or diluted and contaminated through extensive hybridization it can never be fully recovered." (Derr, slide 38.)

In other words, conservation of a species is meaningless if we are unable to preserve its unique, organic character, which Derr calls the germplasm.

Regardless of our choice to maintain the bison genome, we should accept that changes are inevitable in all aspects of our ecosystems, from individual genomes to entire species and habitats. The changes to the bison genome occurred beyond our notice, just as Sarah Church missed the mass extinction that allowed her to settle on the prairie. The changes were wrought by our own hands, in such a rapid fashion that we were unable to see the impacts until it had already passed, just like the story of the buffalo hunter in *Blood Meridian*. Regardless of the way it happened, the introgression of cattle DNA into the genes of the North American Bison must be considered, if we hope to restore the bison to their previous range. Will it bison roaming the range, or beefalo? In a way, we can't allow the few "purebred" bison to take up their previous range, without threatening their distinctiveness as bison. To maintain that uniqueness, we must keep them divided from the majority of other bison.

Sources: Where the Bison Roamed

- Cody, Col. William F. (Buffalo Bill). *The Adventures of Buffalo Bill*, Cosimo, Inc., 2005.
- Church, Sarah. "Recollections of my trip across the plains in 1891." *Snapshots of History: Church Ranch and the Church Family*. (Personal memoirs.) Unpublished raw data, obtained in an interview with Charles Church McKay, September, 2006.
- Derr, James. American Bison: The Ultimate Genetic Survivor, *The Ecological Future of North American Bison* (conference) Denver Colorado, October 24, 2006.
< <http://www.wcs.org/media/file/GENETICS.Derr.pdf> >
- Ellis, Jay, "What Happens to Country in *Blood Meridian*" *Rocky Mountain Review of Language and Literature*. 2006. 60(1): 85-97.
- Geist, Valerius. *Buffalo Nation*. Voyageur Press, 1998.
- Halbert, Natalie D., James N. Derr. "A Comprehensive Evaluation of Cattle Introgression into US Federal Bison Herds." *Journal of Heredity*. 2007. 98(1): 1-12.
- Higley, Brewster. "The Western Home." Reprinted as "Home on the Range" in *Buffalo Nation* by Valerius Geist. Voyageur Press, 1998.
- Juras, Philip. *The Presettlement Piedmont Savanna - A Model For Landscape Design and Management*, 1997. < <http://www.philipjuras.com/thesis/index.htm> >
- McCarthy, Cormac. *Blood Meridian: Or, The Evening Redness in the West*, NY: Random House, 1985.
- Sanderson, Eric W., Kent H. Redford, Bill Weber, Keith Aune, Dick Baldes, Joel Berger, Dave Carter, Charles Curtin, James Derr, Steve Dobrott, Eva Fearn, Craig Fleener, Steve Forrest, Craig Gerlach, C. Cormack Gates, John E. Gross, Peter Gogan, Shaun Grassel, Jodi A. Hilty, Marv Jensen, Kyran Kunkel, Duane Lammers, Rurik List, Karen Minkowski, Tom Olson, Chris Pague, Paul B. Robertson, and Bob Stephenson. "The Ecological Future of the North American Bison: Conceiving Long-Term, Large-Scale Conservation of Wildlife." *Conservation Biology*. 22(2): 252-266.
- Steckel, Richard H, Jerome Carl Rose. *The Backbone of History*. Cambridge University Press. 2002.
- Stricherz, Vince. *Ancient bison teeth provide window on past Great Plains climate, vegetation*. Public Release. [University of Washington](http://www.eurekalert.org/pub_releases/2006-08/uow-abt080706.php), Aug 7, 2006.
< http://www.eurekalert.org/pub_releases/2006-08/uow-abt080706.php >
- Wishart, David J., ed. "Paleoenvironment" *Encyclopedia of the Great Plains*. University of Nebraska. 2004.
- All figures: Western History/Genealogy department, Denver Public Library.

