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## Eastern Washington University and the Ice Age flood debate: processing the papers of EWU Professor Dale F. Stradling

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EASTERN WASHINGTON UNIVERSITY AND THE ICE AGE FLOOD DEBATE: PROCESSING  
THE PAPERS OF EWU PROFESSOR EMERITUS DALE F. STRADLING

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A Thesis

Presented To

Eastern Washington University

Cheney, Washington

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In Partial Fulfillment of the Requirements

for the Degree

Master of Arts

---

By

John C. Moudy

Spring 2012

EASTERN WASHINGTON UNIVERSITY AND THE ICE AGE FLOOD DEBATE: PROCESSING THE  
PAPERS OF EWU PROFESSOR EMERITUS DALE F. STRADLING

A Thesis

by

John Chase Moudy

THESIS OF JOHN MOUDY APPROVED BY

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Dr. Larry Cebula, Associate Professor, Graduate Committee Chair

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Dr. Charles V. Mutschler, University Archivist, Second Committee Member

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Dr. Jerry R. Galm, Professor, Third Committee Member

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Date

## MASTER'S THESIS

In presenting this thesis in partial fulfillment of the requirement for a master's degree at Eastern Washington University, I agree that the JFK Library shall make copies freely available for inspection. I further agree that copying of this project in whole or in part is allowable only for scholarly purposes. It is understood, however, that any copying or publication of this thesis for commercial purposes, or for financial gain, shall not be allowed without my written permission.

The copyright of the images are held by the source noted in each caption. Any use of these images for commercial purposes will require the permission of the copyright holders. The Otis W. Freeman Accession Register was created by Eastern Washington University-Archives and Special Collections and any use, academic or commercial, requires the permission of the creating agency.

Signature\_\_\_\_\_

Date\_\_\_\_\_

## VITA

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## ACKNOWLEDGEMENTS

### Thesis

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I would like to thank Dr. Laura L. Phillips for the assistance she provided in her Graduate Research Seminar, namely showing me how to organize and store multiple drafts of 20+ pages, as well as tips on creating an annotated bibliography. I would also like to thank Dr. William T. Youngs for his assistance in the Graduate Writing Seminar, namely helping me make the story of the Ice Age Floods and Eastern Washington University flow, no pun intended.

I would like to thank Debbie Bahn, the Electronic Records Archivist at the Washington State Digital Archives for providing me with examples of archival theses. These were valuable in giving me ideas on how to format this thesis.

Finally I would like to thank Dr. Jerry R. Galm for agreeing to be the third reader on my graduate committee in spite of having his own very busy schedule.

### College in General

Coming to the end of a seven year college career (I may go back for a second masters, but that is a few years off at least) it is important to thank the people in my life who helped make it possible. First and foremost is my Mom and Dad who provided encouragement, guidance, and my sole source of financial support until I came to graduate school. It is you who have made this all possible.

I would also like to thank my brother and everyone in my extended family for encouraging me to keep plugging away.

Abstract

of

EASTERN WASHINGTON UNIVERSITY AND THE ICE AGE FLOOD DEBATE: PROCESSING THE  
PAPERS OF EWU PROFESSOR EMERITUS DALE F. STRADLING

by

John C. Moudy

### Background

The Eastern Washington University-Archives and Special Collections have recently acquired the papers of EWU Professor Emeritus of Geography Dale F. Stradling. Stradling taught at EWU for many years and as well as being of significance to the history of the university, this collection also contains material regarding the history, geography, and geology of Washington State and the Pacific Northwest. Stradling was interested in the natural forces that shaped the geography of the Inland Northwest. He collected numerous articles, pictures, and other material on the unique series of geological erosion features known as the Channeled Scablands. Dale F. Stradling was part of a new school of geologists and geographers entering the field in the 1950s and 60s. This group largely accepted the theory that the Channeled Scablands had been formed by a series of massive floods during the Ice Age; a theory that had been largely dismissed by geologists and geographers when it was first proposed by Geologist J. Harlen Bretz in 1923.

### Overall Goal of the Project

This project has two overall goals: The first is to process and make available to the public the Dale F. Stradling Papers. The second is to provide archival training for the student carrying out this project. The archival training will be good experience for developing archival skills as well as good for a resume or other type of application. Specifically the student involved in this project will gain experience organizing a physical archival collection for the archives of a university archives and experience digitizing media for the same archives.

### Thesis

The thesis will describe the reorganization of the Dale F. Stradling Papers, show the connection between Eastern Washington University and the debate over the formation of the Channeled Scablands, and end with Dale F. Stradling and his work along an annotated bibliography containing sources available through the JFK Library system, many of which were used for this thesis.



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## **Chapter 1: The Project**

### Dale F. Stradling Papers

The Dale F. Stradling papers are a relatively small collection in terms of its actual size. In total the amount of actual material is less than five cubic feet, however there is a wealth of information within these papers that represent Stradling's interest in geography in general and the Channeled Scablands in particular. The Dale F. Stradling papers also cover some of the other work undertaken by Stradling in particular research into coastal erosion in the Republic of Ghana.

Contained within EWU's Archives and Special Collections are 2-3 scrapbooks belonging to Dale F. Stradling, however these arrived separately and have already been accessioned as a separate collection. Along with the scrapbooks Archives and Special Collections also has another Stradling collection exclusively consisting of a series of 35 millimeter Kodachrome (a type of color film common from the 1940s to the 1990s) slides of the geography of the Pacific Northwest and other locations. Some of these are commercial images bought by Stradling, however most of them are photos Stradling took himself. There are also a few diagrams created by Stradling himself.

There is also a chance that more papers relating to Stradling's work may come to Eastern. It is possible that all the various material relating to Dale F. Stradling will eventually be combined into one collection, however with the electronic finding aids of today this is less likely to happen. Electronic finding aids have made it much easier for both the archivist and the researcher to locate disparate but similar collections within an archive. As a result there is no longer a pressing need to merge similar

collections to make the reference process easier. This project was specifically focused on organizing the newly arrived Stradling papers.

### Step 1: Organizing the Physical Collection

The Dale F. Stradling Papers arrived at Archives and Special Collections already organized, however they required extensive reorganization for a number of reasons that will be described in the following section.

The Dale F. Stradling Papers are not a very large collection; in total the collection is less than 2 cubic feet. However the collection consists mostly of paper materials and does not contain any large artifacts or media materials, making it quite extensive in spite of its limited size. Most of the paper material consists of notes by Stradling, work related correspondence, journal articles, thesis, newspaper clippings, a few magazines and government publications, and various ephemera.

The notes/lecture material portion of the collection appears to have been organized into folders by geographic location and/or subject matter. In many cases a common date was also used to organize similar material into folders.

Dispersed among the research and lecture materials are a small collection of 35mm Kodachrome color slides as well as a few thesis and a number of maps. After carefully scrutinizing the collection, the decision was made to do some physical reorganization of the materials. The archival rule of provenance calls for archival materials to be retained in their original order unless the needs of the archive or researchers using the collection would be better served with a different order. In the case of the Dale F. Stradling Papers it was decided that the latter was true, especially as

many geologists and geographers might want easier access to the maps.



## Property of EWU Archives

*Figure 1: Stradling Channeled Scabland photo taken from 35 mm slide.  
(Courtesy of Eastern Washington University-Archives and Special Collections).*

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step

was to make a preliminary inventory of the collection. This essentially consists of summarizing the contents of each individual folder in the order in which they arrived; this is a rough list so that the person or persons undertaking the reorganization of a project can refer to and is not a final product. This can be a long and tedious process but having a list to refer to makes so the person processing the collection does not have to memorize a collection's contents; a difficult to impossible task.

After the preliminary list the next step is to remove any corrosive materials from the collection and make photocopies of any paper materials that are particularly fragile.

In the case of the Dale F. Stradling Papers this mainly meant removing staples and

various other kinds of metal fasteners. Although harmless at first the metal eventually rusts causing damage to the surrounding paper. This process will generally take a number of decades and not every archive will remove metal fasteners right away, but for this project the decision was taken to remove the fasteners as soon as possible.

Along with the metal fasteners we also discovered a few documents among the Scablands materials that had been printed on Thermofax paper. A Thermofax was essentially a special heat sensitive paper that was placed over a document and exposed to infrared energy, creating an exact copy. By the 1980s this technology was largely obsolete but it would have still been in use in the 1960s from which the earliest Stradling material dates. Unfortunately Thermofax paper is highly corrosive if kept in sustained contact with regular paper, and as soon as these documents were photocopied the originals were disposed of. A number of Ghanaian newspapers were also discovered among the Ghana material. Photocopies of the newspapers were made and put into the collection; however most of the originals were also retained as they remained in good condition. After this process was completed the focus was back on the physical reorganization of the collection.

The decision was made to separate the theses and the maps from the research and lecture material. The research and lecture materials was already divided between the material related to the work on coastal erosion carried out in the Republic of Ghana in the 1990s and research carried out regarding the Channeled Scablands and other local geography, most of which dates from the 1960s to the 1980s. This division made sense because of the differences in location and age of the material and was retained for the

processed collection. Fortunately the theses and the maps were all related to the science of the Channeled Scablands, making further division by subject unnecessary.

Much more anomalous than the maps or the thesis were the 35 mm color slides. Although part of the Dale F. Stradling Papers the slides use the exact same format of film as the images in the Dale F. Stradling Photograph Collection. As a result these slides will be held under the photograph collection, although they will be listed under the Dale F. Stradling Papers with a note in the papers directing researchers to the photograph collection.

For the slides extensive reorganization is not necessary. This is partially because of the small number of slides contained in the Stradling papers, but mainly because all of the images are of the Grand Coulee in the Channeled Scablands. On top of that the slides have already been numbered in a logical order using the sleeve number and order of the slides in the sleeve. The only change in transferring these slides from one collection to another was replacing the original sleeves with the acid free sleeves used for archival preservation.

For the order of each individual file an alphabetical-chronological order was used. The research and lecture material was organized alphabetically by title, while the theses were organized by the author's last name. The only variant to this rule was the maps: folders containing maps of one quadrant (a unit of measurement used for mapping a landscape) were alphabetized by the title of the quadrant regardless of the title of the map. This was done because any geologist or geographer using the collection might look at the individual quadrangle before looking at the title of the map. Maps of wider



## Property of EWU Archives

*Figure 2: Aerial view of the Columbia River Basin (courtesy of Eastern Washington University-Archives and Special Collections).*

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title.

After

the new order of the collection was determined the next step was re-boxing and re-folding the physical collection. The folders and the boxes the collection came were of a general type easily found at any office supply store. For archival preservation a different type of acid free folder is generally used in order to better preserve paper materials. The three boxes the papers originally came in are also of a more generic and non-acid free type. The new boxes are again of the acid free type used by archives and measure 1/3 of a cubic foot each. In total ninety folder and five boxes were required for the Dale F. Stradling Papers.

For the process of labeling the finished collection many archives use the same or similar processes that have been used since the early 20th century. Each folder was

titled and numbered with the box and folder number by pencil. The collection number was stamped on with a collection stamp (a stamp with rotating numbers and letters) and the name of the repository "EWU Archives & Special Collections" was also stamped on. For their collection numbers Archives and Special Collections uses a seven numeral numbering series with two three letter prefixes. Materials from the universities own records are labeled with the prefix EWU then a number, materials not originating from the universities own records but containing material relevant to the collection policy of Archives and Special Collections is labeled with the prefix SPC, meaning Special Collection. The Dale F. Stradling Papers are part of the latter group and have been assigned the number SPC 010-0682.

After each folder was labeled and put in the archival boxes (1/3 cubic feet each), each box will be labeled with a sticker containing the name of the collection, the collection number, the repository (EWU Archives and Special Collections), and the box number. The information is typed onto each sticker using an electric typewriter, which although old fashioned is not uncommon in many archives. The JFK Library (of which Archives and Special Collections is attached) maintains two IBM Correcting Selectric III typewriters in case faculty and students need to use them.

For the final order of the reorganized materials, the question was what material within the papers will researchers likely be interested in first. Because of Eastern Washington University's location within the Channeled Scablands it was determined that the Scabland and other local geography material should come first while the Ghana material should be at the back of the collection. Out of all the Scabland material it was



decided that the maps should come first followed by the rest of the research material. After this came the theses as they also relate to the Channeled Scablands, but contain more information about the wider geology/geography of the Pacific Northwest. The Ghana related material was placed at the back of the collection.

The final step in the physical reorganization is the creation of detailed finding aids. Part of this is an Accession Register entry for archivists and researchers to locate an archived collection. This will contain the accession number of the Dale F. Stradling Papers, the date they were accessioned, the title of the collection, the type of material contained in the collection, span dates, the archive where the collection is located, the volume of the collection, the agency or individual(s) who donated the collection, a brief description of notable biographical or historical significance, any other notable people involved in the collection, any restrictions to public access, the literary rights, relevant subjects covered by the collection, bulk dates, and finally the original creator of the collection. Traditionally accession registers were maintained in a bound volume but Archives and Special Collections has switched to using electronic copies for most the information on their registers. The accession register for the Dale F. Stradling Papers can be found in Appendix A.

After this there will be a finding aid describing the contents of each individual folder and which box it can be found in. A copy of this finding aid will be placed in the Dale F. Stradling papers to assist researchers. The finding aid is titled with the repository, the collection number, the title of the collection, followed by a brief paragraph describing the type of materials contained the collection. The rest of the finding aid is a

list with an entry for each folder containing the folder number, the title of the folder, and dates for the material contained within the folder. An example of an individual folder entry is shown below and the full finding aid for the Dale F. Stradling Papers can be found in Appendix A.

Box: Folder Dates	Description	Span
1:01 Dated	C+NC Oregon Reisz	Not

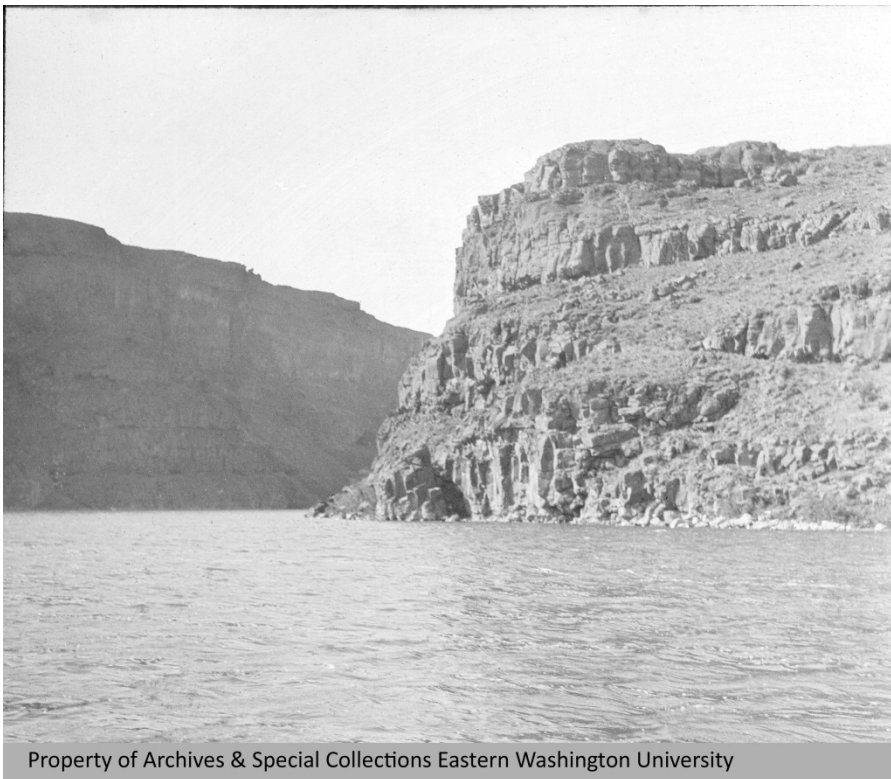
The third finding aid is of course the library catalog, however data entry for that is contractually handled by specific library employees, Archive and Special Collections will provide the necessary information to the library staff.

### Step 2: Digitizing 35mm Slides

After organizing the physical collection the second phase of this project will be the digitization and online publication of some or all of Dale F. Stradling's 35mm color slides. Archives and Special Collections has already digitized other photograph collections contained in their archive and made them available online at their digital collections website <http://econtent.library.ewu.edu>. Stradling's slides would be a very relevant addition to the digital collections for both its significance to the history of EWU and the local history of the area.

It was also decided to digitize some images from the work of another Eastern geographer, Otis W. Freeman. Freeman was from an earlier time than Stradling, but he also focused on the Channeled Scablands of Eastern Washington. Freeman taught at Eastern from 1924-1953 and among his various materials held at Archives and Special

Collections are a large collection of glass lantern slides, most or all of which date from the 1920s. This collection of images numbers in the hundreds and some have already been digitized and put online. It was decided to add some more for this project because of the focus on the Channeled Scablands. Unlike Stradling, who preferred using diagrams to supplement his images, Freeman used maps. Another major difference is that Freeman's images are all in black and white as opposed to Kodachrome, with a number of the images hand colored. Freeman was also more interested in the way humans interacted with the local landscape taking a lot more images of farms and other human structures identifiable with the Channeled Scablands than Stradling. Freeman also bought many commercial slides of non-local geography, which Stradling apparently didn't. The copyright of the commercial images has yet to be determined.



*Figure 3: An example of one of the Otis Freeman images, taken from a glass lantern slide. Photo of Blue Lake (courtesy of Eastern Washington University- Archives and Special Collections).*

In the case of Dale F.

Stradling we were dealing with an equally large collection of images but from two separate archival collections; a number of slides from the Dale F. Stradling Papers and a larger collection of the same type of slides from the Dale F. Stradling Photograph Collection. After carefully looking over the images all three collections 47 of Freeman images and 37 of the Stradling images were chosen for digitization making a total of 84 new images to add to the JFK Libraries Digital Collections.

While organizing a physical collection involves the use of methods that have been in use at archives for many decades (especially in a smaller archives), the type of quick and large scale digitization of archival materials has only become possible in the last couple of decades with the rise of cheap data storage and relatively inexpensive commercial programs for saving and editing scanned images. The only key step that still requires more expensive custom software is for tagging metadata to a digital image and uploading said images onto a database.

The first step is scanning the original slides and saving the scanned images. Like many archival facilities, Archives and Special Collections use Adobe Photoshop. Two color images are created for each slide: first we create an uncompressed 1200 dpi TIFF image and then a more polished JPEG image also at 1200 dpi, but at a much smaller size. These standards were created for this project, but they follow common practices at many other archives.

The JPEG image is what is published online as it is smaller and impossible to get a publication grade copy (paper publication) from. This ensures that while the image is available for public viewing any professional use will have to be negotiated with Archives

and Special Collections. The TIFF images are stored in an offline database as backup copies should something go wrong with a JPEG or any other scenario where a new JPEG is needed. The finished images will be searchable on <http://econtent.library.ewu.edu/> which can also be reached through the EWU Libraries Digital Archives link on the JFK Library page.

In the context of this project this process is made more intricate by the different scanners needed for scanning and the different computers they are connected to. For the Freeman images we used a Hewlett Packard Scanjet 4890, a small flatbed scanner along with Photoshop Elements 5. A plastic slide template that fit this particular model of scanner was used to ensure that each glass slide was perfectly straight before scanning. Each slide was scanned in 8 bit Greyscale and saved as a Tiff file. A number of the hand colored slides were also digitized and in these cases RGB Color was used instead of Greyscale. These TIFF files will be as used as a backup for the images that go online, as well as a preserved digital copy of the original. TIFF are the ideal format for the initial digital copy as it is easy to edit and compress TIFFs into different formats.

For the images that went online a number of changes were made. First, a JPEG copy was made from each TIFF. Unlike the TIFF images which were uncompressed, the JPEGs were saved at a low resolution in order to prevent anyone from getting a publication grade copy from the online image. Another measure taken to prevent copyright infringement is the addition of a label "Property of Archives and Special Collections Eastern Washington University" at the bottom of the image. This is done by enlarging the canvas of each image beyond the scale of the original picture creating a

grey bar at the bottom and typing the copyright notice on the grey bar. The copyright for every image is wholly owned by Archives and Special Collections.

Each JPEG was also edited to remove any scratches or other wear marks on the original image. This involves using both the paint and airbrush functions in Adobe Photoshop, which involves adding color to the original image that is not part of the original artifact. This is done for the purposes of public presentation and although there is a historical argument to be made against this level of editing, the image as it originally was remains preserved in the TIFF file.

After TIFF's and JPEG's were created for the selected Freeman images Stradling slides came next. For these images a similar process was used, the biggest difference being the scanner. Instead of a standard flatbed scanner Archives and Special Collections is fortunate enough to have Nikon Coolscan V 35mm Scanner, specifically designed to scan 35mm slides. This eliminates the need for cropping the image and helps create the most optimum image quality. For the Stradling images RGB Color was used for creating every TIFF. The film scanner used for the Stradling slides was connected to a different (and newer) computer with Adobe Photoshop Elements 10, although the process for creating TIFF's and then JPEG's was almost the same as with the Stradling images.

The two major differences involved the editing of the JPEG's. As the Stradling images were much newer than the Freeman slides, there were not as many scratches and other forms of wear and tear on the 35 mm originals. There was however one notable exception in a slide that had suffered so much damage that it could not be made presentable and in the end it was decided to simply create a TIFF for preservation

purposes. The other difference was that the much smaller canvas of the digitized 35 mm images necessitated the use of a much shorter copyright notice at the bottom of each JPEG. In the end it was decided that the label "Property of EWU Archives" sufficiently and correctly stated who held the copyright.

Each online photo collection also comes with its own description. As the metadata is tagged to each individual photo this description is merely three paragraphs. The first paragraph contains relevant information on the images themselves, the second contains relevant information on the historical and biographical significance of the collection, and the third is on the physical collection the images came from and when it was acquired by EWU's Archives and Special Collections. In the case of the Otis W. Freeman Collection a description has already been created, but for the Stradling images a new collection is being started and a description was written. Below is what written for the Stradling collection.

#### The Images

The Dale F. Stradling photograph collection consists of over 100 35mm images that were taken by Stradling for use in his lectures. Most of these images are of principle physical geography in the western half of the United States with most of the views taken in the Pacific Northwest.

Most of the Pacific Northwest images were taken in Washington and Oregon. The collection includes many images of geographic features in the Channeled Scablands, a unique series of geological erosions formed by repeated flooding. Stradling spent a large part of his career researching the floods role on forming the geography known as the

Scablands. Some dam sites on the Columbia are also included in the collection. The photographs illustrate Stradling's study of geomorphology, the history of the natural forces that have shaped a landscape, and using that to predict future changes to the land.

#### Biographical Note

Dale F. Stradling (1930-2008), geographer, was a native of the landscape he spent a good part of his life studying. Stradling was born in Yakima, Washington and was raised in the nearby town of Prosser. Stradling also began his studies at EWU receiving his BA from the Eastern Washington College of Education (now EWU) followed by a Masters of Education also from Eastern. He also pursued a PhD at the University of Nebraska. After some time away from academia, Stradling was hired as a professor of geography by Eastern in 1965.

Over the course of his career at Eastern, Stradling published numerous articles, presented at many conferences, and served as an editor for the Association of Pacific Coast Geographers journal *Yearbook*, as well as numerous government and academic publications. From 1978 until his retirement in 1997, Stradling was also the chair of the Department of Geography and Anthropology. As part of his research Stradling helped build on the discovery of multiple Ice Age Floods in the Channeled Scablands. Specifically Stradling was interested in how the flood waters shaped specific parts of the Scablands landscape. Stradling's research was known for its collaborative and interdisciplinary nature. He frequently worked with geographers and anthropologists from his own



department, as well as colleagues from the geology and history departments at EWU.

After retiring in 1997, Stradling continued to teach part time as an Emeritus Faculty member until his passing in 2008. In recognition for his scholarship, teaching, and service to EWU, Stradling was awarded the coveted Trustees Medal in 1991. Today Stradling is fondly remembered by his fellow faculty at Eastern Washington University.

After creating an electronic image the next step is to create the metadata for each image. This consists of a relevant title for the photo, a very short description, relevant subject headings, the creator of the original image, the date of the original image, possibly some additional comments on the photo, object type (i.e. image), accession number, image number, archive housing the image, original format (i.e. 35mm slide), scanned format, and the rights and restrictions (with contact information for anyone interested in using a photo). For the process of creating and tagging to photos, as well as uploading photos, Archives and Special Collections uses CONTENTdm version 5.3.216, an off the shelf product.

There is a link to each collection on the main page of the libraries digital collections website. Clicking on the link will bring up every photo in the selected collection in alphabetical. Every individual metadata field in a photo is also searchable via the search bar. There is also an option to bring up every photo in alphabetical order, but this makes for a very long and tedious search. When you select a photo you get the larger image with the metadata below it.

#### List of Digitized Images

Below is a complete list of the images that were digitized. The images are divided

by the physical collections they originate from and then listed in the order in which they appear in the collections. The labeling of the individual slides can be a little confusing as the slides from the Dale F. Stradling Papers were labeled labeled with numbers while the slides from the Dale F. Stradling Image Collection are labeled alphabetically.

#### Dale F. Stradling Papers

The slides here are labeled with a number series that begins with the collection number, followed by the box number, than the folder number, the number of the sleeve containing the slides (there were two sleeves containing about twenty slides in total), and finally a slide number for each image within the sleeve. All of these images are off the Grand Coulee in the Channeled Scablands.

SPC 010-0682\_1-21-1-3

SPC 010-0682\_1-21-1-9

SPC 010-0682\_1-21-2-1

SPC 010-0682\_1-21-2-3

SPC 010-0682\_1-21-2-8

#### Dale F. Stradling Photograph Collection

The slides from this collection are initially divided by the number of the box they are in and then each slide is titled with the location it shows and ordered alphabetically. The titles were written on the slides by Stradling himself and while they accurately describe what is pictured they also contain some peculiarities that were probably for Stradling's own purposes.

Box 1

Basalt and Range\_Landfill\_+16

Basalt\_Basalt CR

Basalt\_Basalt Dikes + Misc\_East of White Pass

Basalt\_Basalt Dikes\_Kimberly Central Oregon

Basalt\_Basalts CK

Columbia River & Basin\_Columbia River Wallula Gap\_OCT79-13

Columbia River and Basin\_Sentinal Gap 12

Columbia River Basalt, Yakima Folds, Ancestral Columbia River\_Ellensburg Canyon 27

Box 4

Palouse-Columbia River\_Palouse 1

Palouse-Columbia River\_Palouse Reardon 7

Palouse-Columbia River\_Palouse-Presentation Slides\_Eastern Washington Sediment

Patterned Ground\_Pattern Ground\_Mounds in Sprague Quadrangle

Patterned Ground\_Pattern Ground\_South of Keller Ferry AUG 79

Box 5

Scablands, Missoula Floods\_Columbia River Maryhill Area

Scablands, Missoula Floods\_Erratic West of Creston

Scablands, Missoula Floods\_Erratic

Scablands, Missoula Floods\_Grand Coulee Dry Falls

Scablands, Missoula Floods\_North Rocky Mountains Missoula Basin

Scablands, Missoula Floods\_Spokane Valley, East Liberty Lake Quadrangle

Scablands, Missoula Floods\_Wallula Gap

Scablands, Missoula Floods\_ West Oregon Willamette Valley

Snake River\_ Good on Basalt Snake River

Snake River\_ Looking Northwest Snake River 4 L

Snake River\_ Salmon River Snake River

Snake River\_ Snake River 13

Snake River\_ Snake River 17

Snake River\_ Snake River Air Trip

Snake River\_ Snake River

Yakima Folds\_ Columbia Plateau Yakima Folds Ellensburg Canyon\_ Roza Dam Yakima River

Yakima Folds\_ Folding Eastern Washington College Gorge Yakima Folds

Yakima Folds\_ Horseheaven Ridge Landslides

Yakima Folds\_ Saddle Mountains

Otis W. Freeman Photograph Collection

The glass lantern slides that make up the Otis W. Freeman Photograph Collection are housed in the same type of drawers traditionally used for card catalogs and small artifacts. Each slide is labeled with the number of the drawer and its numerical place within the drawer in ascending order. The slides are grouped by the geographic location where they were taken and have original titles written by Otis W. Freeman. These titles are separate from the order of the slides within the collection apart from the fact that they help determine the geographic location depicted. Below is the indexing number for each slide alongside the original Freeman title. Freeman's often contain abbreviations and other peculiarities that have been preserved below for the sake of accuracy.

Drawer 3	Original Title of Slide
D-3-64	Erratic Boulder North of Winthrow
D-3-65	Wisconsin Boulder of Basalt
D-3-72	Bedding in Esker E. of Mansfield
D-3-73	Blue Lake
D-3-74	Clear Bed, Blue Lake
D-3-78	North End, Wagonroad Coulee
D-3-79	Side Canyon Falls
D-3-80	Head of Northrop Canyon
D-3-81	Aerial View Steamboat Rock
D-3-83	Ephemeral Lake Lateral
D-3-84	Hanging Wall Grand Coulee
D-3-86	Alligator Head, Dry Falls
D-3-92	Side Falls, Upper Coulee Color
Drawer 4	
D-4-16	Deep Lake
D-4-19	Park Lake, Lower Coulee
D-4-20	Deep Lake Looking South East
D-4-21	Blue Lake, Grand Coulee
D-4-22	Park Lake, Jasper Canyon
D-4-23	Blue Lake, Lower Coulee
D-4-24	Dry Falls

D-4-25	Blue Lake, Lower Coulee
D-4-27	Soda Lake
D-4-29	W. Wall and Floors of Grand Coulee above falls at 11,000 elev.
D-4-30	Junction Col. R. & Goose Flat Channel on right (N).
D-4-31	Great Blade Looking N.
D-4-32	Syncline & Monocline Channels Lower Coulee
D-4-36	Block Diagram, Dry Falls
D-4-37	Diagram Syncline & Monocline Channels, Lower Coulee
D-4-56	Snake Ranch Near Kahlotus
D-4-60	Shore of Granite Lake
D-4-62	Wild Duck Pond Near Cheney
D-4-74	N. End Devils Canyon
D-4-75	South End Devils Canyon
D-4-95	Waterfall, Hole in the Ground
D-4-98	Hole in the Ground
Drawer 5	
D-5-2	Z Canyon
D-5-45	Colfax Topography
D-5-46	Pasco Topography
D-5-50	Topography Map Dry Falls
D-5-51	Saddle Mts. Gorge
D-5-52	Scootney lake Topography

- D-5-53 Wallula Gateway Map
- D-5-54 Diagram Scabland of High Hill Anticline
- D-5-55 Summit Steamboat Rock
- D-5-56 Topography Map Buried Granite Hills
- D-5-57 Channeled Scablands
- D-5-58 Physiography Diagram N. Idaho WM



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*Figure 4: Freeman glass lantern image, Upper Grand Coulee (courtesy of Eastern Washington University-Archives and Special Collections).*

## Chapter 2: The History

### Introducing the Channeled Scablands

"No one with an eye for landforms can cross Eastern Washington in daylight without encountering and being impressed by the 'scabland.' Like great scars marring the otherwise fair face of the plateau are these elongated tracts of bare, or nearly bare, black rock carved into mazes of buttes and canyons. Everyone on the plateau knows scabland. It interrupts the wheat lands, parceling them into hill tracts less than 40 acres to more than 40 square miles in extent. One can neither reach them nor depart them without crossing some part of the ramifying scabland."<sup>1</sup>



*Figure 5:  
Channeled  
Scablands  
location  
(courtesy of the  
U. S. Geological  
Survey).*

Out of  
the many  
scientists who  
have researched  
and written

about the Channeled Scablands of Eastern Washington, few described the area more aptly than J Harlen Bretz did in his groundbreaking research into origin of the this series of unique geological erosions, located in Eastern Washington.<sup>2</sup>

The landscape of the Channeled Scablands can be a bizarre and even unworldly

<sup>1</sup> John Soennichsen, *Bretz's Flood: The Remarkable Story of a Rebel Geologist and the World's Greatest Flood* (Seattle: Sasquatch Books, 2008), xi.

<sup>2</sup> Soennichsen, *Bretz's Flood*, xi-xiv.



sight for visitors who are new to the area. When looking at this scarred and pockmarked landscape words like aberrant, abnormal, and even otherworldly come to mind. For many people words like ugly, appalling, and awful may also come to mind.

Whether crossing into Eastern Washington from the Rock Mountains of Idaho, the Cascade Mountains of Western Washington, the forests of British Columbia, or the wheat fields of Eastern Oregon, the Channeled Scablands are a landscape that seems positively alien to its surroundings.

The comparison of the Channeled Scablands to an alien landscape is pretty apt. When the first detailed surveys of Mars were taken in the 1970s, a similar series of geological erosions were discovered albeit on a much larger scale. The braided channels, multiple tributaries, and gravel bars were so similar to the Channeled Scablands, that NASA began testing future Mars probes in the Eastern Washington landscape.<sup>3</sup>

In the book *Fire, Faults, and Floods: A Road and Trail Guide Exploring the Origins of the Columbia River Basin*, authors Marge and Ted Mueller said that "to the casual observer, the landscape from the Cascade Mountains to Western Montana can be decidedly 'unscenic' if what you are looking at is not understood."<sup>4</sup> This can be true for visitors coming from the temperate forests, inlets, and islands of Puget Sound. In comparison the barren and scarred Scablands may seem completely grotesque.

The earliest written description of this land comes from the diaries of Lewis and Clark as they came across Scablands on September 19, 1805. "This was the most

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<sup>3</sup> Soennichsen, *Bretz's Flood*, 257-260.

<sup>4</sup> Marge Mueller and Ted Mueller, *Fire, Faults, and Floods: a road and trail guide exploring the origins of the Columbia River Basin*. (Moscow: University of Idaho Press, 1997), 11.

wonderful escape I ever witnessed; the hill down which he rolled was almost perpendicular and broken by large irregular and broken rocks. The course of this Creek upwards due W."<sup>5</sup> The discovery of the Columbia River Basin revived the spirits of the Lewis and Clark expedition, after months of slow travel over dry land.<sup>6</sup>

After Lewis and Clark came the fur trade and with such unusual surface features, it is no surprise that the Scablands left an impression on many of the fur traders arriving in Washington. On August 29, 1812 Robert Stuart's expedition on behalf of John Jacob Astor's Pacific Fur Company came to the local area. Rather than coming from the east, Robert Stuart started out from Puget Sound and sailed up the Columbia River in 1812. Here Stuart described a "sharp change in the landscape: whereas the ground around Astoria was 'an impenetrable wilderness,' the interior country 'is without a stick of wood, and the soil is an entire desert of sand, even on top of the bluffs."<sup>7</sup>

Tracts of Scabland interrupt rolling wheat fields as well as other expanses of fertile farmland. Much of the Scablands lack the fertile soil necessary for large scale farming, although the land does provide plenty of acres and sufficient foliage for ranching (usually cattle). It is fair to say that use of the Channeled Scablands for human industry has been light. In fact use of the Channeled Scablands for industry has increased in recent years with the U. S. Bureau of Reclamations Columbia Basin Irrigation Project. What the Scablands are arguably most known for is the mystery they presented to scientists trying to determine how this strange landscape came into existence.

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<sup>5</sup> D. W. Meinig, *The Great Columbia Plain: A Historical Geography, 1805-1910* ( Seattle: University of Washington Press, 1968), 26.

<sup>6</sup> Meinig, *Great Columbia Plain*, 26.

<sup>7</sup> Meinig, *Great Columbia Plain*, 42.

## The Pacific Northwest

The Channeled Scablands are part of a larger collection of interesting geologic features known as the Pacific Northwest. This vast expanse of land includes all of Washington, Oregon, and Idaho; as well as British Columbia to the north. The Pacific Northwest is believed to have been formed about 200 million years ago when the original super continent Pangaea broke apart forming a number of smaller land masses.<sup>8</sup> "The fragments were riding aboard a vast segment of ocean bottom being pushed toward North America and away from the spreading center where molten rock was creating an undersea ridge."<sup>9</sup>

Unlike the rest of the continental US, the Pacific Northwest was not part of the North American continent. Instead it formed from a combination of islands and individual rocks that combined through continental drift and collided with the North American Continent, "about where Idaho, Washington, and Oregon meet today."<sup>10</sup> This also meant that the plate pushing the Pacific Northwest (the Juan De Fuca Plate) and the North American Plate were now pushing against each other, setting the stage for the mountains ranges and volcanism of today.<sup>11</sup>

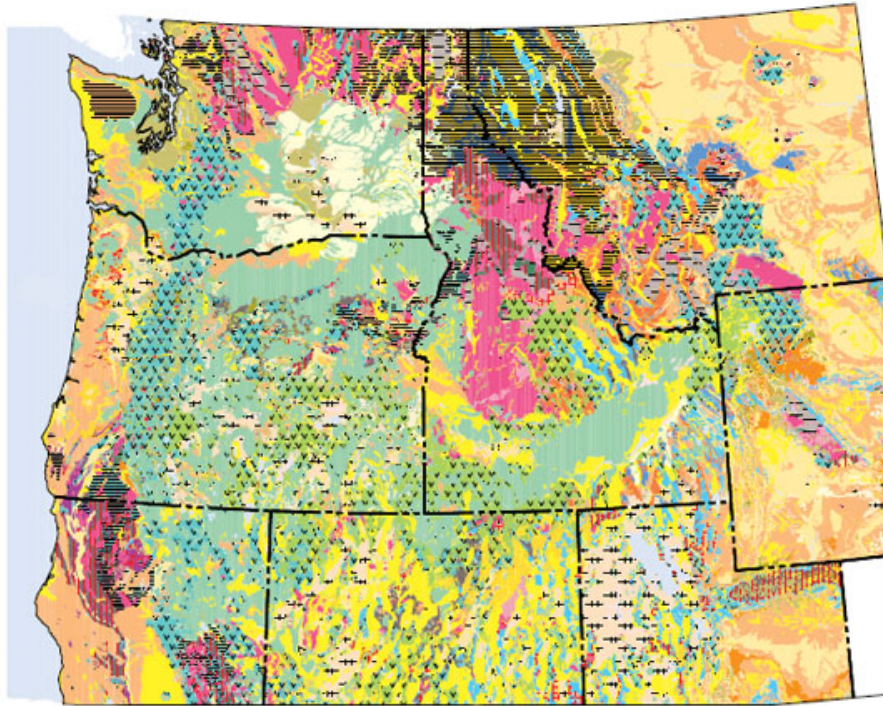
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<sup>8</sup> Hill Williams, *The Restless Northwest: A Geological Story* (Pullman: Washington State University Press, 2002), 37-40.

<sup>9</sup> Williams, *The Restless Northwest*, 37.

<sup>10</sup> Williams, *The Restless Northwest*, 39.

<sup>11</sup> Williams, *The Restless Northwest*, 93-101.



Beginning about 17 million years ago and ending about 11 million years ago,

Figure 6: Geologic Map of the Pacific Northwest (courtesy of the U. S. Geological Survey).

the Pacific

Northwest experienced a series of volcanic eruptions creating the Columbia Basin, a relatively flat plain covering what had been a swamp.<sup>12</sup>

### What about the Channeled Scablands?

By the early 20th century, the basic facts behind the formation of most of the Pacific Northwest were known, but there was still one area that scientists were baffled by and that was the Channeled Scablands.

It was known that the Channeled Scablands were formed during the last ice age. This is not long ago in terms of geologic time and its makes the Scablands one of the few major geologic events that early humans may have witnessed, although this has been

<sup>12</sup> Williams, *Restless Northwest*, 93-101.

difficult to prove.<sup>13</sup>

When passing through Eastern Washington, scientists were confronted with a landscape where much of the topsoil appears to have been ripped away exposing the basalt rock underneath. The basalt itself is far from untouched and has numerous canyons as well as many smaller channels that appear to have been cut into the basalt by some great force. On top of the numerous canyons and other channels there are also a great many lakes that reside in large holes that seem as if they have been drilled into the rock. What is mysterious about these features is that there is nothing to explain their scale; the rivers that do run through the Scablands are not large enough to produce the extensive erosion seen in the basalt and apart from the inadequate amount of water, there is no other natural force to explain this scarred landscape.<sup>14</sup>

Along with the basalt formations, there are also numerous gravel bars as well as large boulders deposited throughout this Channeled Scablands. Gravel bars are formed at bends in a rivers path or at the confluence of two or more rivers. What is unusual about these bars is that many of them are far too large to be formed by the river(s) they border and others are too far away from a water source to be formed at all. The boulders are an even greater mystery, scattered randomly throughout that Scablands and of a rock type not found in the local geology.<sup>15</sup>

The questioned the Scablands posed to early geologists and geographers was

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<sup>13</sup> Marge Mueller and Ted Mueller. *Fire, Faults, and Floods: a road and trail guide exploring the origins of the Columbia River Basin* (Moscow: University of Idaho Press, 1997), 25-29.

<sup>14</sup> Mueller, *Fire, Faults, and Floods*, 17.

<sup>15</sup> John Elliot Allen and Marjorie Burns and Sam C. Sargent. *Cataclysms on the Columbia: a laymen's guide to the features produced by the catastrophic Bretz's Flood's in the Pacific Northwest* (Portland: Timber Press, 1986), 28-29.

quite simply how, how did such a barren landscape form so abruptly in a place that is bordered by far more fertile surroundings on all sides. How did such a force, powerful enough to cause such erosion, enough to cut canyons and other scars in the rock reach the Channeled Scablands?

The solution was water, but not the limited amount of water seen in the Channeled Scablands today. Instead a series of massive floods occurred during the last Ice Age, shaping the landscape into what we are familiar with today.

The exact number of floods is still a matter of scientific debate, with differing theories ranging from just one flood to over a hundred, but what is clear is the size each flood would have to be. These floods had a force roughly ten times anything produced by large rivers today and was fed by a water source comparable to the Great Lakes of today . Each flood would have been carrying roughly 2400 cubic feet of water per second and included ice, rock, and other debris that had been swept up along the way. At times the depth of the flood water would reach 1100 feet and the speed would be as fast as seventy miles an hour, threatening any animal, plant, or rock unlucky enough to be in its path.<sup>16</sup>

Today this is the accepted theory behind the formation of the Channeled Scablands. It also helps that almost ninety years of research conducted by geologists and geographers, using the latest technology, to unearth a wealth of evidence that points to the existence of a complex series of floods and the paths they took. But this evidence was not available to the scientific community when the ice age flood theory was first

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<sup>16</sup> KSPS Public Television Spokane, *Sculpted by Floods: The Northwest's Ice Age Legacy*, DVD (Spokane, WA: KSPS Public Television, 2001).

suggested in 1923.

On top of this issue, there was no clear indications of where the water came from, putting any scientist supporting this theory in a very untenable position with their colleagues. It would about another decade before a link was established between the flooding in the Channeled Scablands and a large glacial lake that had formed after an advancing ice berg blocked the Clark Fork River in Missoula, Montana. With a likely source for the water the ice age flood theory began to move from the world of theory to the world of scientific fact.

#### Detectives on the Trail

To put the mystery of the Channeled Scablands in greater context, it is important to know what it was like being a geologist back then versus being one today. A lot of the aerial imaging technology that is a staple of both fields today simply did not exist in the early 20th century. On top of the lack of imaging technology, there also weren't any planes capable of making a slow enough flyby for a visual analysis. Aviation would only beginning in the early 20th century and it would still take a few more decades for planes capable of highly controlled flights.

Being a geologist then was much more akin to being a detective. You explored the local area, you examined the landscape, you drew on previous work in the field, and you hoped that the mystery of the geologic processes could be solved based on the evidence gathered by you and other scientists working on similar mysteries. For the Channeled Scablands, the obvious suspect was glaciers.<sup>17</sup>

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<sup>17</sup> Allen, *Cataclysms on the Columbia*, 12-13.

By the late 19th century, glaciers were understood as a potential cause of the kind of extensive erosion seen in the Channeled Scablands. During the Earth's last ice age, the climate "moved ice as far south as between the 47th and 48th latitudes, a short distance south of the Canadian border with Washington."<sup>18</sup> Ice sheets had carved massive valleys, fjords, and lakes into the surrounding landscape. Massive moraines and glacial outwash plains were created at the perimeter of these ice sheets where glaciers deposited the material they had transported.<sup>19</sup>

To scientists in the early 20th century, ice certainly looked like the likely culprit to explain the Channeled Scablands. There was just one problem, in the course of every Ice Age the Earth had endured, the ice sheet to the north never quite reached the Channeled Scablands. It had come close, engulfing the mountains and forests of Northern Washington, as well as swallowing Puget Sound, but ice never quite came to the Channeled Scablands.<sup>20</sup>



*Figure 7: Example of Channeled Scabland geology in the Palouse Canyon near Palouse Falls (courtesy of the historylink.org).*

Many scientists tried to salvage this theory by suggesting that the ice sheet had reached the Scablands and previous calculations were wrong. Suggestions were

<sup>18</sup> Soennichsen, *Bretz's Flood*, 83.

<sup>19</sup> Soennichsen, *Bretz's Flood*, 82-84.

<sup>20</sup> Soennichsen, *Bretz's Flood*, 83-85.



made that ice had broken off and had been carried into the Scablands with help from the Columbia River or some other water source. In the end, none of this theorizing yielded any concrete results; there simply wasn't any ice to be had.<sup>21</sup>

Without the presence of ice, the cause of the Channeled Scablands remained a mystery for many decades after its discovery. With satellite technology or even a good aerial view, scientists would have realized what the cause was, but without that technology they had to keep walking, keep examining, and hope for a eureka moment that would finally unravel the mystery of this strange landscape. That eureka moment finally came in 1922 from an already well known geologist, J Harlan Bretz, but it would involve putting his reputation on the line and triggering a debate in the geologic community that would last for the next couple decades.<sup>22</sup>

#### People behind the Debate (J Harlan Bretz)

"To Bretz, sitting in the edge of this deep, basalt-line gash in the earth, his extraordinary vision seemed almost prophetic, but at the same time unfeasible, unbelievable, completely impossible to substantiate."<sup>23</sup>

This was the problem that Dr. J Harlan Bretz faced on his second field trip into the Channeled Scablands in 1923. He had found an answer to one of the greatest geological mysteries in the world, but he knew that this answer was going to get him into trouble with his colleagues in the profession that the 41 year old Bretz had dedicated the last

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<sup>21</sup> Soennichsen, *Bretz's Flood*, 217-221.

<sup>22</sup> David D. Alt, *Glacial Lake Missoula and its humongous floods* (Missoula: Mountain Press Publishers, 2001), 15-19.

<sup>23</sup> Soennichsen, *Bretz's Flood*, 5.

twenty years of his life.<sup>24</sup>

J Harlan Bretz was born Harley Bretz in 1882 to Oliver and Rhonda Bretz. The eldest of five children, the Bretz's were one of many farming families located around the small town of Saranac, Michigan.<sup>25</sup>

As with many farming families at the time, Bretz was under pressure to join the family business once he was done with public school. However in spite of "his father's desire that Harley become a farmer, he gave his son permission to seek out higher education if this was what he really wanted. And, so, in 1901, Harley Bretz began attending classes at Albion College, a small Methodist institution in Albion, Michigan."<sup>26</sup>

When he received his Bachelor of Arts in Biology in 1906, Bretz found his first post college job teaching biology at a high school in Flint, Michigan. In spite of his initial interest in biology, over the next two years, Bretz began to rethink the direction of his life.<sup>27</sup>

A meeting of various men and women of science at the Michigan Academy of Science was hosted by the University of Michigan. There Bretz "met field geologists whose names he recognized, and they entertained him with their stories of field trips to exotic, dangerous locales in pursuit of geologic evidence."<sup>28</sup> After this, Bretz was convinced that there was much more room for a scientist to explore new territory in the field of geology.<sup>29</sup>

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<sup>24</sup> Soennichsen, *Bretz's Flood*, 21-26.

<sup>25</sup> Soennichsen, *Bretz's Flood*, 6.

<sup>26</sup> Soennichsen, *Bretz's Flood*, 8.

<sup>27</sup> Soennichsen, *Bretz's Flood*, 13.

<sup>28</sup> Soennichsen, *Bretz's Flood*, 16.

<sup>29</sup> Soennichsen, *Bretz's Flood*, 15-17.



Figure 8: J Harlen Bretz (courtesy of [historylink.org](http://historylink.org)).

In another key precursor to his later work in the Channeled Scablands, Bretz took a new teaching job at Franklin High School in Seattle, Washington in 1908 and proceeded to teach there for two years. It was during these two years that Bretz introduced himself to the geology of the Pacific Northwest and he was instantly hooked.<sup>30</sup> As his interest in geology grew, Bretz began to dedicate more of his time to college level research and in 1910 he

left the public school system to pursue a geology degree at the University of Chicago.<sup>31</sup> After graduating in 1913, Bretz took an Assistant Professor position at the University of Washington, bringing him back to his land of choice and began his first scholarly work in the Pacific Northwest.<sup>32</sup>

In a foreshadowing of his later work, Bretz initially researched the glaciations of Puget Sound that occurred during the last ice age. At this point, Bretz strictly followed the conventional wisdom of the geologic community. In his first publication a prominent member of the Washington State Geological Survey said that he had the "honor to

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<sup>30</sup> Soennichsen, *Bretz's Flood*, 15-17.

<sup>31</sup> Soennichsen, *Bretz's Flood*, 26.

<sup>32</sup> J Harlen Bretz, *Glaciation of the Puget Sound Region* (Olympia: Frank M. Lamborn Public Printer, 1913), 9-12.

submit here with a report entitled 'Glaciation of the Puget Sound Region,'<sup>33</sup> by J. Harlen Bretz, with the recommendation that it be printed as Bulletin No. 8 of the survey reports,<sup>34</sup> and indeed it was.

In particular Bretz was following the idea of "uniformitarianism," the idea that any geological formation is the result of slow processes that occur over thousands of years, at speeds far exceeding the average human lifespan. This concept became "embedded into the practice of geology, thereby greatly hindering progress in the understanding of cataclysmic flooding as a geological process."<sup>35</sup>

Specifically Bretz wrote about a number of glacial lakes around the Puget Sound area. Ice age flooding was an accepted phenomenon at this time, which nineteenth century geologists had already developed into a legitimate geological concept. The primary difference between these early flood stories and Bretz's later theories is that the majority of the erosion was produced by ice, not water. Ice was the culprit, water was merely an accomplice.<sup>36</sup>

J Harlen Bretz quickly fell in love with the geology of the Pacific Northwest. Unfortunately he did not fall in love with his co-workers at the University of Washington and by next year he headed back to the University of Chicago to teach there.<sup>37</sup> In spite of this Bretz longed for the Pacific Northwest again and after conducting a number of

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<sup>33</sup> Bretz, *Glaciation of Puget Sound*, 4.

<sup>34</sup> Bretz, *Glaciation of Puget Sound*, 4.

<sup>35</sup> Devon Burr, Victor R. Baker, and Paul Carling, *Megaflooding on Earth and Mars* (Cambridge, UK: Cambridge University Press, 2009), 1.

<sup>36</sup> J Harlen Bretz, "Glacial Lakes of Puget Sound: Preliminary Paper," *Journal of Geology* 18 (July-August 1910): 448-458

<sup>37</sup> Soennichsen, *Bretz's Flood*, 41.

geological fields trips into the Dalles area of Wisconsin,<sup>38</sup> he succeeded in organizing and conducting a number of geological fields trips to study the basalt formations of the Columbia River.<sup>39</sup>

This was not J Harlen Bretz's first encounter with the geology of the Inland Northwest. His first encounter occurred in 1910, when Bretz was still a Seattle High School teacher. According to Bretz, it was in this year that he walked into the University of Washington's Department of Geology and looked at a United States Geologic Survey map of the Quincy basin.<sup>40</sup> However it was the trips to the Columbia River valley from 1916-1919 that led Bretz to the Channeled Scablands, as Bretz began "to notice some anomalies about this deep river canyon that would make a good deal more sense after he had begun to hike and explore the sun-baked terrain of Southeastern Washington."<sup>41</sup>

#### People Behind the Debate (Joseph Pardee)

Unlike Bretz, who came from the world of academia, Joseph Pardee came from the world of government, specifically the United States Geological Survey. It was in the employ of the USGS that Pardee would do all of his geologic research from 1909 through 1941.<sup>42</sup>

The other notable difference is the lack of information on the life of Joseph Pardee as compared to J Harlen Bretz. As the first person to write about a major scientific breakthrough in the field of geology, and the almost lone defender of that

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<sup>38</sup> Soennichsen, *Bretz's Flood*, 55.

<sup>39</sup> Soennichsen, *Bretz's Flood*, 52.

<sup>40</sup> Soennichsen, *Bretz's Flood*, 21.

<sup>41</sup> Soennichsen, *Bretz's Flood*, 52.

<sup>42</sup> Robert L. Fuchs. "GSA Beneficiary of the Pardee and Kelly Estates." *GSA Today: A Publication of the Geological Society of America* 5 (September 1995), 169.

breakthrough for a few decades, Bretz got a lot of attention and is the subject of many books and articles. Pardee had a career that was a more discreet, careful not to challenge the norms of the geologic community even as he had evidence that could exonerate Bretz.

Pardee grew up in an environment more suited to the study of geology, specifically mining. Pardee's father was a miner in Salt Lake City when Pardee was born in 1871. Three years later the family moved to Philipsburg, Montana, where the elder Pardee went from working in a mine to owning a mine.<sup>43</sup>

Pardee's education began at the now defunct Presbyterian College in Deer Lodge, Montana. Later Pardee studied chemistry and mining at the University of California, Berkeley from 1889 to 1891. Unlike Bretz, Pardee's interest was geology-related from the very start, but he did not enter the scientific field itself. Instead Pardee worked in the private sector, operating a gold and sapphire mine, but a growing interest in geological research led him to join the United States Geological Survey in 1909.<sup>44</sup>

Whereas Bretz would wait many years for his first encounter with the ice age flood, Pardee's exposure occurred in the first year of his career, when he came to the Missoula Valley in Montana to look for evidence that a glacial lake had formed there.<sup>45</sup>

Joseph Pardee was not the first scientist to point to the existence of a glacial lake in Missoula Valley, Montana. "As long ago as 1885 Professor Chamberlin noted a curious phenomenon in the Flathead lake region that he aptly describes as 'a series of parallel

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<sup>43</sup> Fuchs, "GSA Beneficiary," 169.

<sup>44</sup> Fuchs, "GSA Beneficiary," 169.

<sup>45</sup> Victor R. Baker, "Joseph Thomas Pardee and the Spokane Flood Controversy," *GSA Today: A Publication of the Geological Society of America* 5 (September 1995): 169-172.

watermarks of the nature of exceptionally slight terraces sweeping around the sides of the valley and encircling the isolated hills within it, like gigantic musical staves."<sup>46</sup> This observation was made as part of a larger survey done by geologist T. C. Chamberlain for the U. S. Geological survey.<sup>47</sup>

Further study into the possibility of Glacial Lakes in the area was carried out as part of a dissertation by geologist Earl Douglas in 1899, who noted that "in the Missoula and Bitter Root valleys on the mountain sides and along the foothills are level lines or small terraces, evidently shore-lines, formed by the dashing of the waves."<sup>48</sup>

Although somewhat covered by previous scientists, no one had yet pointed to a glacial lake in the specific location of Missoula Valley, Montana. This distinction would go to Joseph Pardee with the publication of a 12 page article in *The Journal of Geology* in 1910.<sup>49</sup>

In the starkest contrast to Bretz career, Pardee immediately moved on to new research after the publication of his article. While Bretz would spend a large portion of his career researching the Channeled Scablands, Pardee moved on to other assignments, distinguishing himself with studies on the mineral composition of the Rocky Mountains.<sup>50</sup>

Part of the reason for this difference may have been the nature of Bretz and Pardee respective positions. Bretz was an academic, free to carry out any sort of research he could get the funding for, and was constrained only by his teaching

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<sup>46</sup> Joseph T. Pardee, "The Glacial Lake Missoula," *The Journal of Geology* 18 (May-June 1910), 376.

<sup>47</sup> Alt, *Humongous Floods*, 7-8.

<sup>48</sup> Pardee, "Glacial Lake Missoula," 376-377.

<sup>49</sup> Pardee, "Glacial Lake Missoula," 376-386.

<sup>50</sup> Alt, *Humongous Floods*, 10.

commitments. Pardee was a government employee for the U. S. Geological constrained by the work his employers wanted him to carry out.

Another reason may have been that while a catastrophic ice age flood was a controversial theory at that time, a glacial lake was not. By the 19th century, glacial lakes were very much accepted in the geologic community as one of the products of advancing and receding ice sheets. At the same time that Pardee was researching Glacial Lake Missoula, Bretz was doing his first college level work around Puget Sound, which included researching the existence of glacial lakes.<sup>51</sup>

It wasn't until 1922 that Joseph T. Pardee once again returned to the flood shaped lands of the Inland Northwest, this time to study the same Scablands that Bretz was researching that same year.<sup>52</sup>

Like Bretz, Pardee noted the unusual pattern of erosional features found in the basalt, but unlike Bretz, Pardee did not come to the radical conclusion that this was caused by flood water. Pardee suggested that one of the ice sheets may have extended into the Channeled Scablands, "far beyond what heretofore has been regarded as the southern limit of glaciation."<sup>53</sup> It is interesting to note that Pardee does not guarantee that this is the answer to the geologic riddle.<sup>54</sup>

Pardee's conclusions were published in a brief three paragraph announcement in the academic journal *Science*. In the brief article Pardee states that he "expects to study

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<sup>51</sup> Bretz, *Glaciation of Puget Sound*, 9-12.

<sup>52</sup> Alt, *Humongous Floods*, 21-22.

<sup>53</sup> Joseph T. Pardee, "Glaciation in the Cordilleran Region," *Science* 56 (December 1922), 687.

<sup>54</sup> Pardee, "Cordilleran Region," 686-687.



the region further and to publish the results later on,"<sup>55</sup> but there would be no more publications on the Channeled Scablands from Pardee.

In spite of the lack of work produced from Pardee's research, this did mean that he was one of the few scientists familiar with the terrain that Bretz was exploring and when Bretz brought his radical conclusions to the Geological Society of America, Pardee would be one of the few scientists to listen with a more understanding and sympathetic ear.<sup>56</sup> It is also possible that Pardee's research on the Channeled Scablands led him back to the nearby Glacial Lake Missoula. It was there that J. Harlen Bretz and Joseph Pardee challenged some of the basic understandings of the region's geology.

#### Bretz Becomes a Heretic

The idea of an ice age flood has been part of the geological field since the nineteenth century. Proglacial Lakes, created when an advancing iceberg blocks a river channel or a lake, producing a much larger lake from the trapped water, are a recognized geological phenomenon across the globe.<sup>57</sup>

The first scientist to suggest a massive flood covering a large section of land in the Pacific Northwest was geologist Thomas Condon in 1871. He theorized that the Willamette Valley of Oregon was once inundated with water creating a "Willamette Sound." Condon's work was also significant because he theorized that the source of the water was a flooded Columbia valley, pointing to the correct source for the flood water.<sup>58</sup> Another scientist, C. L. Lancaster, studied the Columbia River Valley and in 1915

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<sup>55</sup> Pardee, "Cordilleran Region," 686.

<sup>56</sup> Alt, *Humongous Floods*, 21-22.

<sup>57</sup> Bretz, *Glaciation of Puget Sound*, 9-12

<sup>58</sup> Allen, *Cataclysms on the Columbia*, 3-5.

proposed that the Columbia River once held a much larger volume of water based on the discrepancy between the erosion patterns surrounding the river and the size of the river itself.<sup>59</sup> Other geologists doing work around the same area also noted similar patterns in the surrounding hills as evidence of a large body of water.<sup>60</sup>

Building on the work of previous geologists, Bretz concurred with previous theories that a lobe of an ice sheet dammed the Columbia River, causing a submergence of the lower Columbia River Valley that serves as a border between Washington and Oregon. Like the geologists that came before him, Bretz used the presence of boulders carried from other parts of the Columbia River, presumably when the ice dam broke, and the presence of gravel bars that are too big to have been created by the present day Columbia River.<sup>61</sup>

At first looking for evidence of glacial lakes created from water overflowing from the blocked Columbia River, Bretz found what he believed was evidence of an extensive system of glacial lakes and subsequent drainages in the landscape that he would later name the Channeled Scablands.<sup>62</sup>

But even as Bretz was writing this narrative, and preparing an article for the *Journal of Geology*, he saw that his flood narrative and the evidence around him did not quite fit. The various water channels and coulees in the Scablands contained a braided erosion pattern, very different from the branching pattern that Bretz had seen when studying glacial flooding in Puget Sound. To add to the mystery the amount of stray

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<sup>59</sup> Allen, *Cataclysms on the Columbia*, 145-147.

<sup>60</sup> Pardee, "Glacial Lake Missoula," 376-377.

<sup>61</sup> Bretz, "Late Pleistocene Submergence," 492-493.

<sup>62</sup> J Harlen Bretz, "Glacial Lakes of Puget Sound: Preliminary Paper," *Journal of Geology* 18 (July-August 1910): 448-458.

material deposited in some of the dry channels seemed to suggest that they were

formed at the same time, again not typical for glacial flooding.<sup>63</sup>



Figure 9: Map Bretz drew of the Channeled Scablands (courtesy of historylink.org).

The erratic boulders, which Bretz also labeled as proof a receding ice sheet, were also proving problematic. For one thing, Bretz was finding these boulders as far south as the

Oregon border in the southeast corner of Washington. It would have been very difficult for a flood originating from the Columbia River to carry rocks this far away from it. On top of this, Bretz was finding boulders in places his flood would have a hard time leaving them. Generally an erratic boulder would be found in a low spot along a channel or coulee, but Bretz was finding many of these boulders on high points, particularly on hills facing towards the Scablands.<sup>64</sup>

For Bretz, the final clues that turned him away from conventional geologic theories were the Grand Coulee and the Quincy Basin. The Grand Coulee is a large canyon running through the eastern half of the Scablands. The Grand Coulee is much as three miles wide in some places and contains evidence that it once held large waterfalls. At the same time the Quincy Basin, a large depression adjacent to the Columbia River,

<sup>63</sup> Soenichsen, *Bretz's Flood*, 86-87.

<sup>64</sup> Soenichsen, *Bretz's Flood*, 87-88.

contained evidence of a volume of water so powerful that the walls of the basin had been breached in multiple places leaving paths to the Columbia River. Faced with this evidence, Bretz came to the conclusion that what he was looking at was not a slow seepage of water from the Columbia River, but a sudden flood on an unheard of scale.<sup>65</sup>

Certainly Bretz's fellow geologists did not want to hear it. Geology was a field built on the idea of slow geologic processes that shaped this world over thousands of years. When Bretz presented his findings to a meeting of the Geological Society of America in 1927, it sounded like he was pushing biblical ideas of catastrophic events that happened overnight, and his colleagues ambushed him in a wave of criticism.<sup>66</sup> When he walked out of the conference, Bretz felt like "his one chance to bring others around to his point of view had been a failure."<sup>67</sup> However it would not be the end for Bretz, nor the ice age flood theory.

In spite of this harsh reception, there was a small group of scientists that defended, or at least sympathized with Bretz ideas. Joseph Pardee was at the 1927 conference and may have sympathized with Bretz, because he had or would soon have the geologic evidence to exonerate him.<sup>68</sup> However Pardee was a silent sympathizer, possibly protecting his own distinguished career with the U. S. Geological Survey. More active in his defense was geographer Otis Willard Freeman, who had just been hired by Eastern Washington University, then the Cheney State Normal School, in 1924.<sup>69</sup>

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<sup>65</sup> Soenichsen, *Bretz's Flood*, 88-93.

<sup>66</sup> Soenichsen, *Bretz's Flood*, 189-194.

<sup>67</sup> Soenichsen, *Bretz's Flood*, 194.

<sup>68</sup> Baker, "Spokane Flood Controversy," 169.

<sup>69</sup> Charles W. Booth, and Dale F. Stradling, "Geography at Eastern Washington University," *Association of Pacific Coast Geographers Yearbook* 54 (January 1992): 112.

### He Actually has a Doctorate

Otis W. Freeman was born in Otsego, Michigan in 1889. He graduated with a Bachelor Degree from Albion College in 1910, before getting his Master of Science degree from the University of Michigan in 1913. After this Freeman taught geography at Michigan, Montana, and California high schools, before joining the faculty of the Cheney State Normal School to teach geography and geology.<sup>70</sup> In 1929, Otis W. Freeman received his PhD from Clark University with the completion of his thesis, "Human Geography of the Scablands of Eastern Washington." Freeman's thesis began a long writing career and exemplifies what would be the primary interest of his life, the Pacific Northwest and economic geography. Over the next 24 years, Freeman would go on to distinguish himself in the annals of both the field of geography and the history of Eastern Washington University.<sup>71</sup> In his own words, "resources are the corner-stone of urban development. The pioneer village depended largely on crops, the placer miner's temporary settlement depended on tiny flakes of gold mixed with tons of sand and gravel, the cowboy's town upon the supply of grass, the fish cannery on the Pacific coast upon the salmon migrations."<sup>72</sup> This unique meeting of geography, economics, and history is commonly called Economic Geography, although it was also known as Human Geography back in Freeman's time.<sup>73</sup>

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<sup>70</sup> Howard H. Martin, "Otis Willard Freeman 1889-1964," *The Journal of Geography* 63 (December 1964): 332.

<sup>71</sup> Booth, "Geography at Eastern," 112-114.

<sup>72</sup> Otis W. Freeman, "Natural Resources and Urban Development," *The Annals of the American Academy of Political and Social Science* 242 (November 1945): 30.

<sup>73</sup> Otis Willard Freeman, "Human Geography of the Scablands of Eastern Washington," (PhD diss., ClarkUniversity, 1929),i-vii.



Figure 10: Modern Context of Channeled Scablands (Courtesy of the U. S. Geological Survey).

In the context of Eastern Washington University, Freeman was a strong advocate for the expansion of the

college beyond the boundaries

of a teachers college and towards a more comprehensive public institution. It was not surprising that when the Cheney State Normal School became the Eastern Washington College of Education in 1937, one of the first subjects offered beyond a teaching degree was geography, with Otis W. Freeman as the head of the new department.<sup>74</sup>

In the early years of his tenure at Eastern, Freeman raised the profile of the institution through numerous journal articles, book publications, peer reviews, and collaborative work with other authors. "He expanded his staff at Cheney, gave papers at science and geography meetings, was active in the western division of the A. A. S and held visiting professorships, and/or summer posts in other institutions including,

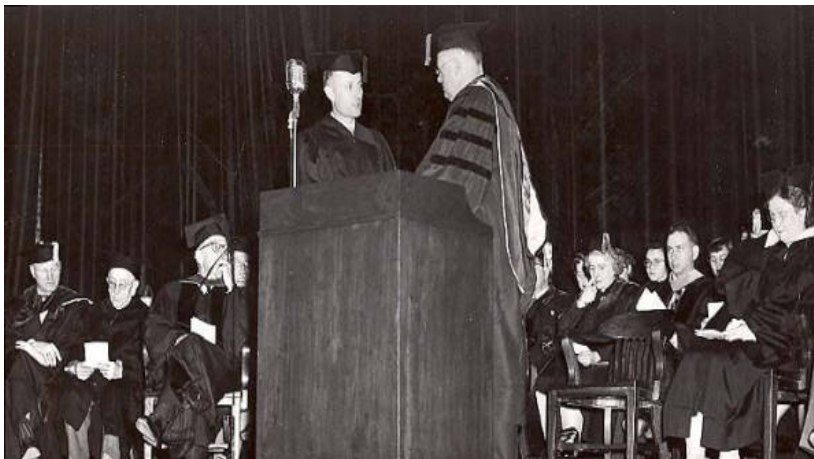
<sup>74</sup> Booth, "Geography at Eastern," 115-116.

Indiana, Hawaii, San Francisco, and Washington."<sup>75</sup>

### Bretz makes Freeman a Believer

Looking to understand more about the local area, Otis Freeman decided to join J Harlen Bretz on one of his field trips to the Channeled Scablands. Freeman joined an expedition Bretz was holding in 1927, three years after he had been hired by the Cheney State Normal School, but two years before receiving his doctorate and concurrent with the work he was doing on his thesis.<sup>76</sup>

If Bretz made a believer out of no one else on that field trip, it is clear that he made a believer out of Freeman, and two years later when his doctoral thesis was completed, Freeman said that "the theory accounting for the origin of the scablands has been ably presented by Dr. J Harlen Bretz and will be discussed in chapter one of this thesis."<sup>77</sup>



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moving on to the

geologic conditions of

Freeman's thesis begins with the geologic formation of the Channeled Scablands for the first 45 pages, before

*Figure 11: Otis W. Freeman's Inauguration as College President 1951, Freeman is the Person Standing on the Right (courtesy of Eastern Washington University-Archives and Special Collections).*

<sup>75</sup> Martin, "Freeman 1889-1964," 332.

<sup>76</sup> Freeman, "Human Geography," vii-xi .

<sup>77</sup> Freeman, "Human Geography," x.

Channeled Scablands after the Ice Age Flood. In this section Freeman states that "cause of the Spokane Flood is unknown."<sup>78</sup> But in defense of Bretz, "the hypothesis that the Scablands were formed by moderate amounts of water setting at different times in separate parts of the area is not in accord with the evidence of the anastomised channels and gravel channels and gravel deposits." Most of the thesis, from pg. 110 to the final writing on page 251, is devoted to the history of human civilization in the Scablands and how that ties into the geography of the area.<sup>79</sup>

Most notable in the context of the Ice Age Flood Theory, is the part where Freeman describes the geologic formation of the Channeled Scablands prophetically mentioning that scientist H. T. Harding's theory "that a possible water supply for the creation of channeled scablands was from a lake impounded in Clark's Fork Valley near Missoula, Montana, by an ice dam. The difficulty with this hypothesis is that Harding submits no evidence from abandoned shorelines, etc., that such lake ever existed."<sup>80</sup>

It is ironic that Freeman discounted a glacial lake theory that was correct except for the location of the glacial lake. However given that there was no aerial photography to confirm the presence of shoreline and given that scientists at the time had yet to conceive of a glacial lake as large as the one in Missoula

It is important to remember that in the 1920s it was highly unusual to find any scientist in any field who was defending Bretz, making Freeman one of the few. It was also very bold of Freeman to come down on Bretz's side considering that, at this point,

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<sup>78</sup> Freeman, "Human Geography," 20.

<sup>79</sup> Freeman, "Human Geography," 20.

<sup>80</sup> Freeman, "Human Geography," 20-21.



he still couldn't explain where the flood waters had come from.<sup>81</sup>

Otis W. Freeman was well aware of this contradiction and offered up his own theory that "an exceptionally powerful tropical cyclone, or hurricane, came further north than usual near the end of summer melting of the ice sheet towards the natural close of the glacial period."<sup>82</sup> Freeman hypothesized that this cyclone or hurricane either broke up the ice sheet to the north, releasing massive amounts of water trapped behind it, ripped large amounts of ice away from the ice sheet and deposited what had been broken off in the form of flood water, or ripped a chunk of ice that preceded to block a major river causing flooding from the backup.<sup>83</sup>

All of these guesses turned out to be wrong, but when considering what evidence was available at the time and that Freeman saw water playing a major role on the Channeled Scabland floods, it was an intelligent and forward thinking attempt to solve the mystery of Bretz's flood.

Freeman returned to the subject of the inland northwest with the publication of "Land Utilization of the Channeled Scablands," in the *Economic Geography* journal in 1931. In this article, Otis Freeman narrowed the more wide reaching focus of his thesis and focused specifically on agriculture in the Channeled Scablands.<sup>84</sup>

The main focus of this next article is the various kinds of soils in the rolling hills that are bisected by tracts of scabland and how these soil types determined what kind of agriculture was developed in the area. However the main significance of this piece to the

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<sup>81</sup> Soennichsen, *Bretz's Flood*, 189-194.

<sup>82</sup> Freeman, "Human Geography," 21.

<sup>83</sup> Freeman, "Human Geography," 21-24.

<sup>84</sup> Otis W. Freeman, "Land Utilization in the Scablands of Eastern Washington," *Economic Geography* 7 (January 1931): 28-40.

Channeled Scabland debate is another explicit defense of J Harlen Bretz stating that "according to Bretz, during the glacial period a tremendous flood that resulted from the rapid melting of an ice sheet, poured down across the plateau, which slopes toward the confluence of the Snake and Columbia rivers."<sup>85</sup>

Throughout the 1930s, Freeman published a number of other articles as well as a few books tying together the economy, history, and geography of local industry. Most notably, Freeman wrote about apple growing in the Wenatchee Valley, the pea industry in Washington and Oregon, and the Grand Coulee. Freeman also continued to publish articles about natural resources in general, mainly in the context of how to best preserve said resources.<sup>86</sup>

When Freeman retired in 1953 he had seen the successful completion of two of his academic goals. What was once a teacher training facility had expanded into a comprehensive public institution granting multiple bachelor's degrees and a Masters of Education. Bretz had been exonerated through a combination of Joseph Pardee's 1940 revelation of a glacial lake in the Missoula Valley, Montana, that had breached its ice dam sending a large volume of water towards the Channeled Scablands,<sup>87</sup> and the discovery of more definitive proof during the excavations carried out for the Columbia Irrigation Project.<sup>88</sup>

The question for scientists at Eastern was no longer how to defend Bretz, but how to expand on his theories. The evidence uncovered in the Columbia Basin had

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<sup>85</sup> Freeman, "Land Utilization," 28.

<sup>86</sup> Freeman, "Land Utilization," 28.

<sup>87</sup> Martin, "Otis Willard Freeman 1889-1964," 332.

<sup>88</sup> Victory R. Baker, eds., *Catastrophic Flooding: the Origin of the Channeled Scabland* (Stroudsburg: Dowden, Hutchinson, and Ross, 1981), 164-168.

proven that there were in fact multiple floods, but how many? Also there were a lot of details on the way in which the floods had shaped specific parts of the Channeled Scablands that needed to be filled in.

In the 1960s and 70s, Eastern was a perfect location for further research into the Scablands. The geography program had expanded to include eleven faculty members. Collaborating with geography was an Anthropology Department and a History Department with faculty researching the ways in which people have used the Scablands, as well as a Geology Department researching the natural history of the Scablands often in conjunction with the Geography Department. This collaborative environment yielded a wealth of new material on the Channeled Scablands and awarded degrees to new scholars also interested in the local landscape.<sup>89</sup> A good example of this era of research and scholarship can be found in the works of Geographer Dale F. Stradling.

#### A New Era of Scholarship

A native of Washington, Dale Fordyce Stradling was born in Yakima on April 5, 1930, to Howard and Lucy Stradling. He spent much of his early life in the nearby town of Prosser, Washington and graduated from Prosser High School. Stradling received his bachelors at Eastern Washington State College followed by a Master's in Education also from Eastern. His area of interest was geography and at Eastern Stradling studied under Otis W. Freeman, an influential geographer who had helped found Eastern's Geography Department.<sup>90</sup>

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<sup>89</sup> Charles W. Booth, and Dale F. Stradling, "Geography at Eastern Washington University," *Association of Pacific Coast Geographers Yearbook* 54 (January 1992): 117-118.

<sup>90</sup> Obituary of Dale F. Stradling. *Spokesman Review*. July 9, 2008.

Stradling took a break from academia and served with the U. S. Coast Guard for two years from 1952-1954. After this he taught high school back at Prosser for one year before moving on to a different school in Edwall, Washington for a further two years.

In 1958 Stradling decided to pursue a PhD and moved to Lincoln, Nebraska to attend the Geography program at the University of Nebraska. He then taught geography at Portland State College (now Portland State University) from 1960-1965 before joining the faculty at Eastern in 1965.

From 1965 to 1997 Stradling distinguished himself among Eastern's faculty and in the field of geography. Stradling's focus was Pacific Northwest geography and geomorphology his work has been published in government publications, conference publications, and academic journals. Stradling was also involved in developing the non-profit Ice Age Floods Institute dedicated to research into the Ice Age Floods that shaped the Channeled Scablands.

What made Stradling and many of his contemporaries at Eastern unique among scholars was that they were hired at a time when Eastern Washington University was the Eastern Washington State College and the emphasis was more on teaching than scholarship. Dale F. Stradling and others were hired for their ability to teach.

Most likely as a result of this Stradling and some of the other geologists/geographers he worked with were interested in designing material for a general as well as an academic audience. Having said this Stradling was perfectly happy to increase the pace of his scholarship as the college switched over to a university and academic works became more of a priority. His most well-known contribution to the

field of geography was his role in co-founding the Ice Age Floods Institute an educational non-profit institute in 1995. This institute through its numerous pamphlets and website is a good example of Stradling's research into the Scablands and his efforts to bring his findings to a non-academic audience. He frequently worked with geographers and anthropologists from his own department, as well as colleagues from the geology and history departments at EWU.<sup>91</sup>

On the academic side Stradling published numerous articles, presented at many conferences, and served as an editor for the Association of Pacific Coast Geographers journal *Yearbook*, as well as government and academic publications. From 1978 until his retirement in 1997, Stradling was also the chair of the Department of Geography and Anthropology. As part of his research Stradling helped build on the discovery of multiple Ice Age Floods in the Channeled Scablands. Specifically Stradling was interested in how the flood waters shaped specific parts of the Scablands landscape. Stradling's research was known for its collaborative and interdisciplinary nature.<sup>92</sup>

After retiring in 1997, Stradling continued to teach part time as an Emeritus Faculty member until his passing in 2008. In recognition for his scholarship, teaching, and service to EWU, Stradling was awarded the coveted Trustees Medal in 1991. Today Stradling is fondly remembered by his fellow faculty at Eastern Washington University.<sup>93</sup>

After the 1970s, the amount of work being done in the Channeled Scablands slowed due to a combination of faculty voluntarily departing, faculty retiring, and state

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<sup>91</sup> Obituary of Dale F. Stradling. *Spokesman Review*. July 9, 2008.

<sup>92</sup> Obituary of Dale F. Stradling. *Spokesman Review*. July 9, 2008.

<sup>93</sup> Obituary of Dale F. Stradling. *Spokesman Review*. July 9, 2008.

financial difficulties, however there continues to be a connection between Eastern Washington University and the landscape the college inhabits.<sup>94</sup>

Together the work of Freeman, along with the work of Stradling and his colleagues allowed Eastern Washington University to play a vital role in the geologic debate over the Channeled Scablands, from Freeman's defense and promotion of Bretz in the early years of his theory to the work of Stradling and his colleagues, refining and adding to the flood narrative.

The organization is divided into ten local chapters in Montana, Idaho, Washington State, and Oregon. They have a website <http://www.iafi.org> as well as a facebook page which can be found at <http://www.facebook.com/IceAgeFloodsInstitute>

As part of its goal to educate the public about the ice age floods, each local chapter of the Ice Age Floods Institute has produced a number of field guide brochures. A complete list of these field guides and which chapters have produced them can be found at [http://www.iafi.org/odf/IAFI\\_field\\_guide\\_list.pdf](http://www.iafi.org/odf/IAFI_field_guide_list.pdf)

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<sup>94</sup> Booth, "Geography at Eastern," 118-119.

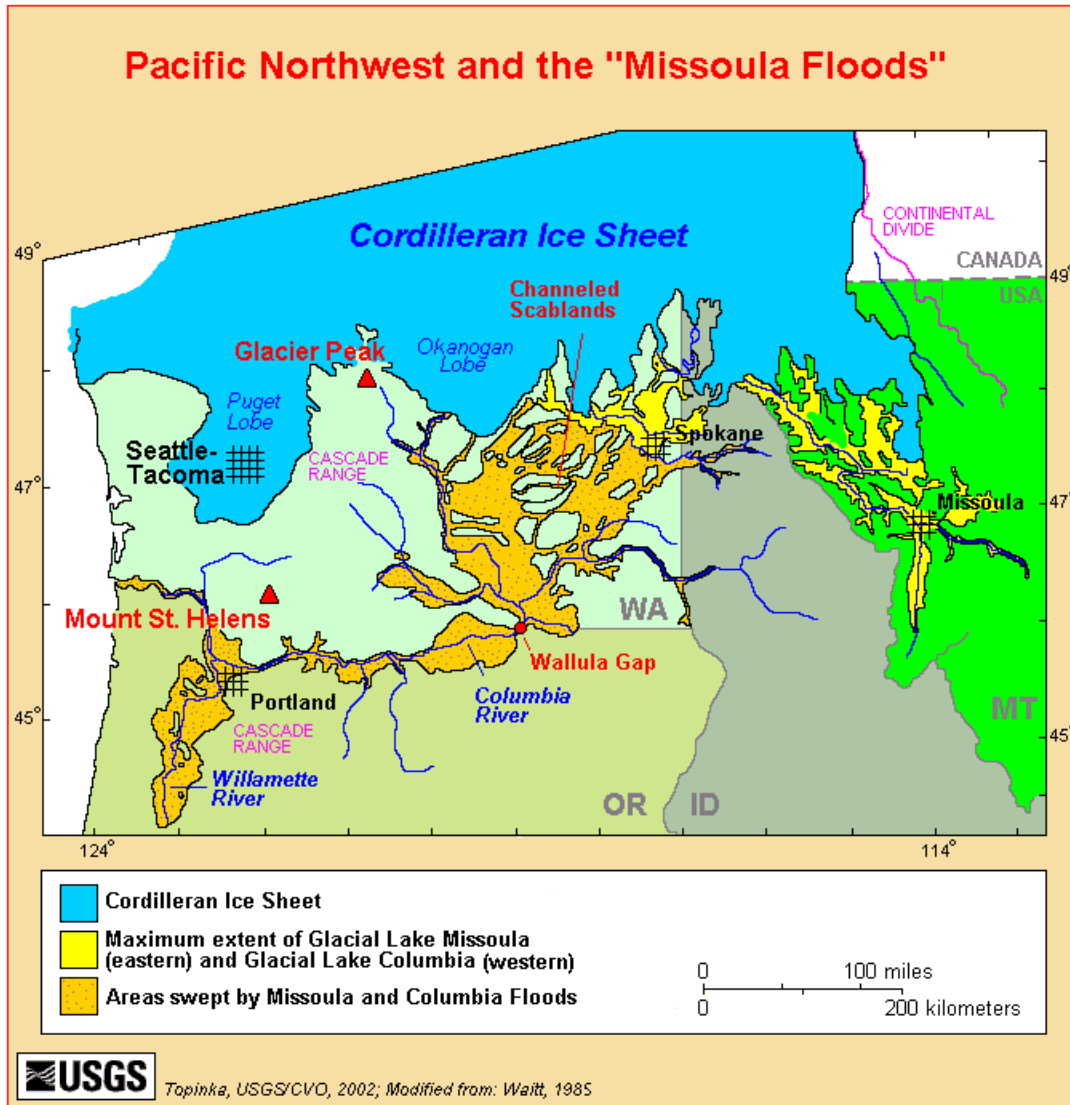


Figure 12: Map Showing the Extant of the Ice Sheet and the Flood Waters (courtesy of the U. S. Geological Survey).

# Appendix A: Dale F. Stradling Papers Accession Register & Index



BASIC DATA SHEET  
EASTERN WASHINGTON UNIVERSITY  
ARCHIVES & SPECIAL COLLECTIONS

1. Accession No. SPC 010-0682                      Date: March 14, 2012
2. Name of Accession: DALE F. STRADLING PAPERS
3. Type of material held: government documents, lecture Notes, research notes, thesis, journal articles, book extracts, newspapers, and various ephemera.
4. Span Dates: 1922-1997
5. Location: Eastern Washington University, JFK Library, Archives and Special Collections
6. Volume: 1.67 cubic foot (90 folders)
7. Source: Dale F. Stradling
8. Biographical / Historical Features: Dale F Stradling (April 5, 1930-2008) was a professor for the Department of Anthropology and Geography at Eastern Washington University from 1965-1997, and an Emeritus Professor of Geography from 1997 until his passing in 2008. Stradling was a resident of Cheney during his tenure and after his retirement. Dale Stradling's primary focus was geography of the Pacific Northwest, although he also did research in Ghana, West Africa shortly before his retirement. Contained in this collection are various government documents, lecture Notes, research notes, thesis, journal articles, book extracts, newspapers, and ephemera.
9. Names of major correspondents: Dale F. Stradling, Jerry Galm, Ruth Galm, Eugene P. Kiver
10. Special Restrictions: None
11. Literary Property Rights: Fully owned by Eastern Washington University.
- 12: Subjects:   Geography  
                  Geology  
                  Geomorphology  
                  Pacific Northwest  
                  Channeled Scablands  
                  Ghana  
                  Shorelines Management.

13. Bulk Dates: 1965-1997
14. NAMES: Stradling, Dale F., Eastern Washington University

Eastern Washington University Archives  
 Accession No. SPC 010-0682  
 STRADLING, DALE F. Papers  
 Finding Aid

Material consists of government documents, lecture Notes, research notes, thesis, journal articles, book extracts, newspapers, and various ephemera used by Geography Professor Dale F. Stradling when he taught geography full-time at Eastern Washington University from 1965-1997.

Box: Folder	Description	Span Dates
1:01	C+NC Oregon Reisz	Not Dated
1:02	Chatteroy Quadrangle (1 of 3)	circa 1987
1:03	Chatteroy Quadrangle (2 of 3)	circa 1987
1:04	Chatteroy Quadrangle (3 of 3)	circa 1987
1:05	Clayton Quadrangle	circa 1987
1:06	Conklin Geology. Map China Bend Mead	1978-1981
1:07	Dartford Area. Dartford Quadrangle	circa 1988
1:08	Elk Area. Elk Quadrangle	circa 1988
1:09	Elk Quadrangle. Eloika Lake Area	circa 1988
1:10	Geology. Maps. Lincoln 15. quad	1944
1:11	Geology. Maps. Shannon Wilson	Not Dated
1:12	Glacial Lakes and Drainage Channels of Washington	1933
1:13	Liberty Lake Quadrangle	Not Dated
1:14	Map. Geology. Keller 15 Quad	1992
1:15	Map. Quadrangle Geology. Lower Granite Hammett Reservoir	1977
1:16	Miscellaneous. Plateau Margin Studies 1977 Shannon & Wilson	1977
1:17	Reflection Lake Area Chatteroy Quadrangle	circa 1988
1:18	Splitoff Area Maps	1959-1962
1:19	Spokane Aquifer Cross Section	Not Dated
1:20	U. S. Geological Survey Quadrangle Maps Folder	circa 1968
1:21	35 mm slides	Not Dated
1:22	Cascades. Oregon	circa 1977
1:23	Chewelah Mountain Geology	circa 1960s
1:24	Columbia Plateau. Oregon	Not Dated
1:25	DNAG. Final Draft. February 8 1988	1988
1:26	E. N. New Funding Enhancement Money	circa 1960s
1:27	Geology. Bend Area. Oregon U. S. Geological Survey	1925-1939
1:28	Geology of the Oregon Part of the Baker	1976
1:29	Oregon. Alt & Human. Biggs. Bend. & S	Not Dated
1:30	Oregon. High Lava Plains Orr. Et. Al.	Not Dated
1:31	Readings. Miscellaneous	1967-1989
1:32	Research Notes	circa 1987
1:33	Spokane 1990. Joseph	1990
1:34	Stradling BA	1960

1:35	Yakima Basin	Not Dated
2:01	Amara. Pacific Northwest	1975
2:02	Cochran. Late Quaternary Stratigraphy & Chronology. 1978	1978
2:03	Foisy. Pacific Northwest. 1967	1967
2:04	Hagood. 1986	1986
2:05	Luke Jr. Pacific Northwest. 1985	1985
2:06	Markam. Pacific Northwest. 1971	1971
2:07	Meinig	1950
2:08	Moody (1 of 2)	1987
3:01	Moody (2 of 2)	1987
3:02	Petrone. Pacific Northwest. 1970 Moses Lake Dunes	1970
3:03	Rau. Pacific Northwest. 1987	1987
3:04	Ringe. Pacific Northwest. 1968	1968
3:05	Schroeder. Physical Geography of the Palouse Region. 1958	1958
3:06	Wozniewicz, John	1989
4:01	Anthony. Edward J. beach-ridge development	1995
4:02	Buckle 1978. Coastal Landforms	1978
4:03	Cape Coast Travel	1996
4:04	Coastal Geometry. Beach Cusps	1968-1978
4:05	Coastal Geometry. Beach Erosion	1971-1972
4:06	Coastal Geometry. Classification	circa 1971
4:07	Coastal Geometry. General Mostly from Textbooks	1971-1995
4:08	Coastal Geometry. Gen Faniran & Jeje, 1983	1983
4:09	Coastal Geometry. Ghana	circa 1980
4:10	Coastal Geometry. Ghana; Boughey, 1957	1957
4:11	Coastal Geometry. Processes	1958-1996
4:12	Coastal Geometry. Research Models	1968-1970
4:13	Coastal Geometry. Sea Level. Changes	1967-1997
4:14	Coastal Geometry. West Africa Other than Ghana	1954
4:15	Coastal Geometry. Yuri Shuisky	1986-1988
4:16	Dixcove Pictures	1994
4:17	Documents. Letters. List of Souvenirs	circa 1996
4:18	Ghana. 1996. Passport	1996
4:19	Ghana. Coastal Geometry. Dei	1965
4:20	Ghana. Coastal Geometry. Gelliers	Not Dated
4:21	Ghana. Darbyshire. 1957. Tema	1957
4:22	Ghana. Davies. 1964. (1 of 2)	1964
4:23	Ghana. Davies. 1964. (2 of 2)	1964
4:24	Ghana File	1996
4:25	Ghana. General Bibliography	1988-1999
4:26	Ghana. Miscellaneous.	1993-1996
4:27	Ghana. Miscellaneous. 1997. (1 of 2)	1997

5:01	Ghana. Miscellaneous. 1997. (2 of 2)	1997
5:02	Ghana. Newspaper Clippings	1992-1996
5:03	Ghana. Personal Correspondence	1995-1996
5:04	Ghana. Proposals, Reports, etc	1993-1996
5:05	Ghana. Publications	1975-1997
5:06	Ghana Travel. 1996	1990-1996
5:07	Ghana Travel. 1997	1997
5:08	Ghana Weather & Climate Data	Not Dated
5:09	Jacobberger. 1988	1988
5:10	Linkage Report. 1996 Trip	1996
5:11	Maps. Ghana Geological Survey No. 29	1963
5:12	Maps. Royal Geographical Society Copies	1922-1959
5:13	Readings. Royal Geographic Society Photocopies Logan.	1997
5:14	Royal Geographical Society Periodicals	1997

#### Materials Removed

Hawaii A Guide to the Islands: An Illustrated Travel Guide  
Nevada Bureau of Mines Report 9  
Washington Division of Geology and Earth Resources Open-File Report  
Washington Index to Topographic & other map coverage  
Washington Map List  
Water Resource Investigations Open-File Report 79-1530

## Appendix B: Otis W. Freeman Papers Accession Register

(Important Note: The Accession Register for the Otis W. Freeman Papers was created years earlier as a typewritten/written document by the University Archivist Dr. Mutschler and not by the author of this paper.)

(The electronic copy is a scanned PDF of the original document and is on the following two pages of the paper version, but available as two separate PDF files for the electronic version.)







## **Annotated Bibliography**

This bibliography contains primary and secondary sources used for this project and available through the physical collections as well as the online databases at the Eastern Washington University library system.

### Database/Collections Key

**IL**=Interlibrary Loan

**JFK-ASP**=JFK Library-Archives and Special Collections (Limited Publications, Personnel Papers, and Academic Thesis)

**JFK-LDA**=JFK Library-Libraries Digital Archives (Digitized Photos from Otis W. Freeman Collection and both Dale F. Stradling collections)

**JFK-LLBS**=JFK Library-Lower Level Book Stacks (One Otis W. Freeman Publication)

**JFK-LLMV**=JFK Library-Lower Level Media Video (Three documentaries on Channeled Scablands)

**JFK-LLPM**=JFK Library-Lower Level Periodical Microfilm/Microfiche (One journal article and one thesis)

**JFK-LLUGDS**=JFK Library-Lower Level US Government Document Stacks (Channeled Scabland Booklets)

**JFK-MLP**=JFK Library-Main Level Periodical (Journal Articles not online)

**JFK-ULBS**=JFK Library-Upper Level Books Stacks (Private and State Government Publications)

**JS**=J-Store (Journal Articles)

**SL**=Summit Libraries (Publications)

**WSUL-OSEL**=Washington State University Libraries-Owen Science and Engineering Library (Dale F. Stradling Conference Abstracts)

### Archival Material

\*Dale F. Stradling Papers. Eastern Washington University-Archives and Special Collections, Cheney, WA. (**JFK-ASC**)

Stradling was a professor of geography at EWU from 1965 to 2008, and the material is within this time-frame. This collection contains notes, lecture material, journal articles, a thesis, photos, 35 mm slides, and various ephemera that relate to Stradling's tenure as a faculty member at EWU. The bulk of this material relates to research Stradling did on the Channeled Scablands of Eastern Washington or the Republic of Ghana, Africa in the 1990s.

\*Dale F. Stradling Photograph Collection. Eastern Washington University-Archives and Special Collections, Cheney, WA. **(JFK-ASC)**

Consists of hundreds of 35 mm color slides of images mostly taken by Stradling himself with a few commercially bought images. Most of the images are of the Pacific Northwest landscape reflecting Stradling's interest in the local area.

\*Otis W. Freeman Papers, 1920-1960. Eastern Washington University-Archives and Special Collections, Cheney, WA. **(JFK-ASC)**

This is one of the largest collections within Eastern's archives, containing much of Freeman's teaching and research material. This consists of film, photographs, paper documents, notes, news clippings, journal articles, correspondence, and lantern slides. It is a vast resource for information on Otis W. Freeman's academic career.

\*Otis W. Freeman Photograph Collection. Eastern Washington University-Archives and Special Collections, Cheney, WA. **(JFK-ASC)**

Consists of hundreds of glass lantern slides of images mostly taken by Freeman himself with a large number of commercially bought images. Most of the images are of the Pacific Northwest landscape as well as human development in the area. The commercially bought images are of people and landscapes in other parts of the United States.

\*Papers, 1934-1972. Eastern Washington University-Archives and Special Collections, Cheney, WA. **(JFK-ASC)**

This collection consists of a copy of the constitution, by-laws, minutes, programs, membership rosters, newsletters, and correspondence pertaining to the Association of Pacific Coast Geographers. Much of this material belongs to Otis W. Freeman, who was very active in this organization.

\*Records 1951-1953. Eastern Washington University-Archives and Special Collections, Cheney, WA. **(JFK-ASC)**

From 1951-1953, Otis W. Freeman served as the President of Eastern Washington University (at the time the Eastern Washington College of Education). These are Freeman's business records while he was president and business related correspondence. A lot of the correspondence has to do with

faculty evaluation, an important issue at a time when Eastern was transitioning from a teacher training facility to a state college.

### Books

#### Dale F. Stradling Books

\*Broderick, Donna H., Dale F. Stradling, and Carlyne McCallister. *The Teaching of High School Social Studies: A Brief Analysis*. Portland: Portland State College Press, 1963. **(SL)**

An early work co-authored by Dale F. Stradling in conjunction with two other professors at Portland State College (now Portland State University).

\*Galm, Jerry R., and R. Lee Lyman. *Archaeological Investigations at River Mile 590: The Excavations at 45DO1289*. Cheney: Eastern Washington University Reports in Archaeology and History 100-61 Archaeological and Historical Services, 1988.

A good example of the interdisciplinary nature of the research conducted by faculty at EWU. This document is about an archaeological excavation along the Columbia River, done by the Anthropology Department at Eastern. At the same time faculty from other departments also contributed to this project, including Stradling.

\*Gilmour, David and Dale F. Stradling, et al. *Proceedings of the Second Columbia River Basalt Symposium, Eastern Washington State College, Cheney, Washington, March 21, 22, 23, 1969*. Cheney: Eastern Washington State College Press, 1970. **(JFK-ULBS)**

This book consists of about twenty essays and other shorter pieces, written by various geologists and geographers for a symposium on the basalt rock that makes up a lot of the Columbia Plateau. Dale F. Stradling and David Gilmour were the editors that brought all the publications together.

\*Stradling, Dale F., and Eugene P. Kiver. "Depositional Environments of Late Pleistocene Mt. Saint Helens Ash in the Northeastern Channeled Scablands of the Columbia Intermontane." abstract, *Mount St. Helens; one year later*. Cheney: Eastern Washington University Press, 1982: 241. **(JFK-ULBS)**

This publication also consisted of a series of essays as well as smaller pieces on the after effects of the eruption of Mount St. Helens. Stradling and his colleague Eugene P. Kiver contributed one of the smaller written pieces at the back of this book. Their focus was the distribution of Mt. St. Helens ash on the Columbia Plateau during the Pleistocene Era.

\*Stradling, Dale F. and Eugene P. Kiver. "Geomorphology of the Columbia Plateau." abstract, *Northern Columbia Plateau Landscapes, Narrative, and Field Guide*. Cheney: Eastern Washington University Press, 1984: 24-30. **(JFK-ULBS)**

Government publication from 1984 containing a history of the Columbia Plateau, maps, and suggested field trips for people visiting the Columbia Plateau, Stradling contributed both a suggested tour people could take by car, as well as an aerial tour intended to be taken with a small plane.

\*Stradling, Dale F. "The Geomorphic History of the Columbia River System." abstract, *The Columbia River, an Inexhaustible Resource?: A Conference*. Cheney: Northwest Institute for Advanced Studies, Eastern Washington University, 1980: 1-24. **(JFK-ASC)**

Printed abstract of a presentation made by Stradling at a conference on the natural resources of the Columbia River, held at Eastern Washington University in 1980. Stradling was also a co-editor of the conference publication.

\*Stradling, Dale F., and Eugene P. Kiver. "The Significance of Volcanic Ash as a Stratigraphic Marker for the Late Pleistocene in Northeastern Washington." abstract, *Mount Saint Helens; five years later; symposium*. Cheney: Eastern Washington University Press, 1986: 120-126. **(JFK-ULBS)**

For this publication Stradling and Kiver took the brief piece they had written for the *Mount Saint Helens; one year later; symposium* and expanded it into a full length essay. The main focus of this article is the use of ash layers as a way of determining the exact number of Ice Age Floods the Columbia Plateau was exposed to.

\*Yarwood, Edmund, and Dale F. Stradling. *The Columbia River, an Inexhaustible Resource?: A Conference*. Cheney: Eastern Washington University Press, 1980. **(JFK-ASC)**

This is a useful source because it is an example of Stradling's work as an editor for geological, geographical, historical publications, and sometimes political publications.

J Harlen Bretz Books

\*Bretz, J Harlen. *Memories. Part III*. Chicago: University of Chicago Dept. of Geophysical Sciences, 1970. **(JFK-ULBS)**

J Harlen Bretz wrote a three part memoir in the early 1970s, about ten years prior to his death. Parts 1 and 2 have never been published and are available at the University of Chicago Library's Special Collections Research Center. Part 3 has seen limited publication and is available at the JFK Library.

\*Bretz, J Harlen. *The Grand Coulee*. New York: American Geographical Society, 1932. **(JFK-ASC)**

This publication from the American Geographical Society concerns the Grand Coulee, a giant canyon within the Channeled Scablands. The Grand Coulee is the largest erosional feature of the Channeled Scablands, being about fifty miles long and nearly a thousand feet deep.

Otis W. Freeman Books

\*Freeman, Otis Willard, and Hallock Floyd Raup. *Essentials of Geography*. New York: McGraw-Hill Book Co, 1949. **(JFK-ULBS)**

This book, co-written by Freeman, is an overview of the subject of geography and how people can master the essentials of the field. It is more of an introductory book than a focus on Freeman's specialty, but it does show Freeman's expertise in the field beyond his Economic Geography focus.

\*Freeman, Otis Willard. *Geography of the Pacific*. New York: J. Wiley and Sons, 1951. **(JFK-ULBS)**

Freeman publication focusing on the geography of the Pacific Ocean and the islands within. It is a good example of some of the work he did outside of the Pacific Northwest

\*Freeman, Otis Willard, and Howard Hanna Martin, eds. *The Pacific Northwest, An Overall Appreciation*. New York: J. Wiley and Sons, 1954. **(JFK-ASC)**

This book contains contributions from multiple geographers and geologists writing on aspects of the local landscape. This is an updated version of an earlier publication from 1942 where Freeman and Howard Hanna Martin also served as editors as well as contributors.

\*Freeman, Otis Willard, and Howard Hanna Martin. *The Pacific Northwest, A Regional, Human, and Economic Survey of Resources and Development*. New York: J. Wiley & Sons, 1942. **(JFK-ASC)**

This book contains contributions from multiple geographers and geologists writing on aspects of the local landscape. This is an earlier version of a later publication from 1954 where Freeman and Howard Hanna Martin also served as editors as well as contributors.

\*Thompson, Margaret, and Otis Willard Freeman. *The Conservation of Northwest Resources*. Seattle: Northwest Conservation League, 1951. **(JFK-ULBS)**

An early environmental work, co-written by Freeman, that argues for and describes how to best preserve the natural resources of the region. It is an interesting and forward thinking direction for Freeman towards the end of his career.

### Government Documents

Dale F. Stradling

\*Kiver, Eugene P., and Dale F. Stradling. *Geology of the Franklin D. Roosevelt Reservoir Shoreline: Glacial Geology, Terraces, Landslides, and Lineaments*. Washindton, D. C.: Grand Coulee Power Office, 1995. **(IL) Available at one library.**

A government report for the Grand Coulee Power Office co-authored by Stradling and his colleague and frequent collaborator Eugene P. Kiver. This report concerns Lake Roosevelt which was created from water blocked by the Grand Coulee Dam.

\*Kiver, Eugene P., Dale F. Stradling, and Ula L. Moody. "Glacial and Multiple Flood History of the Northern Borderlands; Trip B." *Information Circular - State of Washington, Department of Natural Resources, Division of Geology and Earth Resources* (January 1989): 321-335. **(JFK-ULBS)**

This is one of two articles from Dale Stradling and Eugene Kiver which appeared in the 1989 *Information Circular* publication from the State of Washington. This article is a planned road trip of notable sights on the northern half of the Columbia Plateau. The road trip starts at the junction of I-90 and U.S. 2, and ends at Spokane; it is designed to be done in a day.

\*Rigby, James G., et al. *Reconnaissance Surficial Geologic Mapping of the Late Cenozoic Sediments of the Columbia Basin, Washington*. Olympia: State of Washington, Department of Natural Resources, Division of Geology and Earth Resources, 1979. **(SL)**

An example of the interdisciplinary nature of a lot of Stradling's work. This is geologic study of the Columbia Basin containing contributions from numerous geologists and geographers including Stradling and one of his colleagues at Eastern.

\*Stradling, Dale F., and Eugene P. Kiver. "The Northern Columbia Plateau from the air." *Information Circular - State of Washington, Department of Natural Resources, Division of Geology and Earth Resources* (January 1989): 347-353. **(JFK-ULBS)**

The other article written by Stradling and Kiver for the 1989 *Information Circular*. This is another planned tour of the Northern Columbia Plateau, this

time intended to be taken from a small low flying plane. The tour is intended to last for a couple of hours and begins and ends at Spokane International Airport.

J Harlen Bretz

\*Bretz, J Harlen. *Glaciation of the Puget Sound Region*. Olympia: Frank M. Lamborn Public Printer, 1913. **(JFK-ULBS)**

This book contains much of Bretz early research into the glacial geology of Puget Sound. In what was probably an early honor for Bretz, this publication was commissioned by Washington Geological Survey. First published book from J Harlen Bretz after getting his doctorate from the University of Chicago. This is important as an example of Bretz early research and also shows his early interest in the area that begin when he was teaching high school in Puget Sound.

\*Bretz, J Harlen. *Washington's Channeled Scabland*. Olympia: Washington State, Division of Mines and Geology, 1959. **(JFK-ULBS)**

In a further indication that his flood theories were gaining acceptance in the scientific community, Bretz was hired by the Washington State's Division of Mines and Geology to publish his theories in one of the agencies releases. This is an important source because it is a key moment of acceptance for Bretz's theories, when the State of Washington invites him to write about these theories for one of their official publications.

Otis W. Freeman

\*Freeman, Otis Willard. *Grand Coulee and Neighboring Geological Wonders*. Spokane: State of Washington, 1937. **(JFK-ASC)**

This is an important source for my project because as well as containing accurate scientific information on the Channeled Scablands, it provides a window into his work, in particular his early defense of Bretz's flood hypothesis at a time (1937) when most scientists questioned Bretz.

\*Freeman, Otis Willard. *Strategic and Essential Minerals of the Pacific Northwest*. Portland: Northwest Regional Council, 1943. **(JFK-LLBS)**

Written during the Second World War, Otis W. Freeman discusses the availability of some of the essential natural resources needed for the war effort in the Pacific Northwest. As is typical of many of his articles, Freeman talks about the natural geography that allows these resources to exist, before talking about the way these resources influenced human communities in the same area.

\*Freeman, Otis Willard, and Howard Hanna Martin. *The Pacific Northwest, A Regional, Human, and Economic Survey of Resources and Development*. New York: J. Wiley & Sons, 1942. **(JFK-ASC)**

This is important because it is arguable the most extensive work ever published by Freeman on the economic geography of the Pacific Northwest. It also includes information on the geological formation of the region, including support for Bretz and his flood hypothesis.

\*Freeman, Otis W., and Rolland H. Upton. *Washington State Resources*. Seattle: Washington State, Washington State Resources Committee, 1957. **(JFK-ASC)**

This source is important when looking into the work of Otis W. Freeman. Published only seven years before he passed away this revised (from a previous publication in 1954) represents some of the last work Freeman did.

### Journal Articles

Dale F. Stradling Articles

\*Booth, Charles W., and Dale F. Stradling. "Geography at Eastern Washington University." *Association of Pacific Coast Geographers Yearbook* 54 (January 1992): 111-120. **(JFK-ASC)**

This article talks about the history of the Eastern Washington University Geography Department. Otis Freeman role in the founding of the geography department is covered and at the end of the article is a list of every faculty member the department has had as of 1992.

\*Carrara, Paul E., Eugene P. Kiver, and Dale F. Stradling. "The Southern Limit of Cordilleran Ice in the Colville and Pend Oreille Valleys of Northeastern Washington during the Late Wisconsin Glaciation." *Canadian Journal of Earth Sciences = Revue Canadienne des Sciences de la Terre* 33 (May 1996): 769-778. **(JFK-MLP)**

Important because it is one of the last published works that Stradling was involved in published just prior to his retirement.

\*Kiver, Eugene P., and Dale F. Stradling. "Lake Missoula Floods and the Glacier Record along the Spokane and Upper Columbia rivers." *Abstracts with Programs - Geological Society of America* 21 (March 1989): 102. **(WSUL-OSEL)**

It is a printed abstract of a presentation that Dale F. Stradling made at the 21st Annual Geological Society of America Meeting in March, 1989.



\*Kiver, Eugene P., and Dale F. Stradling. "Preliminary Glacial and Flood Chronology, Columbia River Glacier, Northeastern Washington." *Abstracts with Programs - Geological Society of America* 17 (1985): 249. **(WSUL-OSEL)**

It is a printed abstract of a presentation that Dale F. Stradling made at the 21st Annual Geological Society of America Meeting in March, 1985.

McKee, Bates, and Dale Stradling. "The sag flowout; a newly described volcanic structure." *Geological Society of America Bulletin* 81 (July, 1970): 2035-2043. **(JFK-MLP)**

Important as an example of the early research Stradling conducted into the Channeled Scablands and the surrounding areas shortly after his appointment at Eastern Washington University (then Eastern Washington State College).

\*Obituary of Dale F. Stradling. *Spokesman Review*. July 9, 2008. **(JFK-ASC)**

This obituary focuses mostly on his academic career, but it does provide a lot of information on the positions Stradling held, as well as the academic organizations he worked with.

\*Orndorff, Richard, Ted Doughty, and Dale F. Stradling. "GIS-based Analysis of Drainage Reversal in the Pend Oreille River, Northeastern Washington." *Abstracts with Programs - Geological Society of America* 37 (April 2005): 8. **(WSUL-OSEL)**

It is a printed abstract of a presentation that Dale F. Stradling made at the 37th Annual Geological Society of America Meeting in March, 1989.

\*Stradling, Dale F. et al. "An Interdisciplinary Approach to Sole-source Aquifer Management Planning; Geomorphic and Surficial Geologic Mapping Interfaced with GIS Compilation and Presentation." *Abstracts with Programs - Geological Society of America* 26 (January 1994): 98. **(WSUL-OSEL)**

It is a printed abstract of a presentation that Dale F. Stradling made at the 26th Annual Geological Society of America meeting in January, 1994.

\*Stradling, Dale F., Eugene P. Kiver, and James G. Rigby. "Late Pleistocene Floods and Landforms in the Spokane, Washington Area." *Yearbook - Association of Pacific Coast Geographers* 43 (1981): 160. **(JFK-ASC)**

It is printed abstract of a presentation that Stradling, Kiver, and Rigby made at the 43rd Annual Association of Pacific Coast Geographers in 1981.

\*Stradling, Dale F. and Eugene P. Kiver. "Mass Wasting associated with Lake Roosevelt, Washington." *Yearbook - Association of Pacific Coast Geographers* 48, (1986): 205. **(JFK-ASC)**

It is a printed abstract of a presentation that Stradling and Kiver made at the 48th Annual Association of Pacific Coast Geographers in 1986.

\*Stradling, Dale F., and Harold A. Winters. "Some Major Landslides of the Yakima Folds." *Yearbook - Association of Pacific Coast Geographers* 29, (January 1967): 158-159. **(JFK-ASC)**

It is a printed abstract of a presentation that Stradling and Winters made at the 29th Annual Association of Pacific Coast Geographers in 1967.

\*Stradling, Dale F. and Eugene P. Kiver. "The Geomorphology of the Northern Columbia Plateau." *Yearbook - Association of Pacific Coast Geographers* 47, (1987): 132. **(JFK-ASC)**

It is printed abstract of a presentation that Stradling and Kiver made at the 47th Annual Association of Pacific Coast Geographers in 1987.

\*Stradling, Dale F. and Eugene P. Kiver. "The Geomorphology of the West Spokane Plains, Spokane County, Washington." *Yearbook - Association of Pacific Coast Geographers* 49, (1987): 170. **(JFK-ASC)**

It is a printed abstract of a presentation that Stradling and Kiver made at the 49th Annual Association of Pacific Coast Geographers in 1987.

\*Tallman, A. M. et al. "Post Columbia River Basalt Stratigraphy of the Columbia Plateau." abstract, *Abstracts with Programs - Geological Society of America* 14 (April 2005): 239. **(WSUL-OSEL)**

It is a printed abstract of a presentation (that Stradling was involved with) made at the 37th Annual Geological Society of America Meeting in April, 2005.

\*Winters, Harold A., and Dale F. Stradling. "The Yakima Folds: some relationships between Topography and Structure." *Annals of the Association of American Geographers* 57, no. 1 (January 1967): 194-195. **(JS)**

This source is an example of the geographic work that Stradling did in the Channeled Scablands, usually in conjunction with other EWU professors.

J Harlen Bretz Articles

\*Bretz, J Harlen. "Alternative Hypothesis for Channeled Scablands I." *Journal of Geology* 36 (April-May 1928): 193-213. **(JS)**

Many of Bretz fellow geologists hypothesized that a series of ice dams had created a number of glacial lakes out of rivers within the Channeled Scablands. Other geologists thought that a glacier had somehow diverted the flow of the Columbia River toward the Scablands.

\*Bretz, J Harlen. "Alternative Hypothesis for Channeled Scablands II." *Journal of Geology* 36 (May-June 1928): 312-341. **(JS)**

In the second half, Bretz further argues that erosional features in the basalt, and the sheer size and complexity of the gravel bars required far more water than any of the pre-existing rivers could have produced.

\*Bretz, J Harlen. "Bars of the Channeled Scabland." *Bulletin of the Geological Society of America* 39 (September 1928): 643-701. **(JFK-MLP)**

Gravel Bars are elevated hills of sediment, usually sand or gravel that have been deposited by water. Through the size, pattern, and direction of these bars, Bretz describes the flow of the Ice Age Flood, as well as the flow of water since the Ice Age Flood.

\*Bretz, J Harlen, H. T. U. Smith and G. E. Neff. "Channeled Scablands of Eastern Washington: New Data and Interpretations." *Geological Society of America Bulletin* 67 (1956): 958-1049. **(JFK-MLP)**

This article was written in response to some of the new evidence that had come to light, which both vindicated and refined Bretz's flood theories. In this article Bretz, along with his co-authors talks about the new evidence that was unearthed in the Channeled Scablands in the 1950s, as well as Joseph Pardee's theories on Glacial Lake Missoula. Evidence was beginning to emerge of multiple floods and Bretz embraced this, hypothesizing that there were six or seven. However, Bretz disputes Pardee's theories as he feels the patterns of erosion and flood deposits did not support his theory.

\*Bretz, J Harlen. "Glacial Lakes of Puget Sound: Preliminary Paper." *Journal of Geology* 18 (July-August 1910): 448-458. **(JS)**

When this article was published, Bretz was studying the glacial geology of Puget Sound, while pursuing his doctorate at the University of Chicago. This article foreshadows later events, because it is about a series of glacial lakes that were created by Ice Dams during the last ice age. This is the first published work by J Harlen Bretz. It is important because it represents the beginning if a prolific

body of scholarship. It also shows his early interest in the Pacific Northwest and the work that would lead to his first book a few years later.

\*Bretz, J Harlen. "The Age of the Spokane Glaciation." *American Journal of Science* 8 (October 1924): 336-342. **(JFK-LLPM)**

This article is a very brief restatement of the Ice Age Flood Theory, which Bretz first introduced a year earlier in *The Journal of Geology* (article below).

\*Bretz, J Harlen. "The Channeled Scablands of the Columbia Plateau." *Journal of Geology* 31 (November-December 1923): 617-649. **(JS)**

In this article Bretz introduces his ice age floods theory to the geological community. Rather than propose his hypothesis, Bretz begins by describing the unusual layout of the land. After this he introduces this theory as something he was forced to conclude when every conventional application of geological theories failed.

\*Bretz, J Harlen. "The Channeled Scabland of Eastern Washington." *Geographical Review* 18 (July 1928): 446-477. **(JS)**

This article serves as both a reintroduction of the previous article, while also incorporating information that Bretz had learned in the five years since. It is also one of the few Channeled Scablands articles that Bretz did not publish in the *The Journal of Geology*.

\*Bretz, J Harlen. "The Dalles Type of River Channel." *Journal of Geology* 32 (February-March 1924): 139-149. **(JS)**

The pre-existing geological features in the Dalles region of Washington and Oregon, had an interesting effect on the flow of the flood-water. What was a single water channel when it entered the Columbia River, became multiple channels and had some interesting effects on the surrounding valley as well as the river bed.

\*Bretz, J Harlen. 1920. "The Juan De Fuca Lobe of the Cordilleran Ice Sheet." *Journal of Geology* 28 (May-June 1920): 333-339. **(JS)**

Published a few years later than Bretz's other Puget Sound papers, the topic of this essay is glacial erosion. Out of all the Bretz articles pertaining to Washington geology, this essay is one of the few that is not concerned with any form of glacier induced flooding.

\*Bretz, J Harlen. "The Lake Missoula Floods and the Channeled Scabland." *Journal of Geology* 77 (September 1969): 505-543. **(JS)**

Bretz summarizes his own research and that of other scientists who also worked in the Channeled Scablands. Bretz begins with his own research in the 1920s, before moving on to the flood evidence unearthed during the Columbia Basin Irrigation Project as well as some of the research he did during that period. Bretz discusses the way in which new evidence of flooding vindicated and refined his theories, restating his support of the idea of multiple floods. Finally Bretz brings up Joseph Pardee and his discovery of Glacial Lake Missoula, embracing the lake as the source of the flood water.

\*Bretz, J Harlen. "The Late Pleistocene Submergence in the Columbia Valley of Oregon and Washington." *Journal of Geology* 27 (October-November 1919): 489-506. **(JS)**

Through the research conducted for this article, Bretz was introduced to the Channeled Scablands. Bretz was not investigating the Scablands themselves, but the Columbia River Valley.

\*Bretz, J Harlen. "The Satsop Formation of Oregon and Washington." *Journal of Geology* 25 (July-August 1917): 446-458. **(JS)**

Foreshadowing his creation of the term Channeled Scablands, Bretz's creates his own term to describe the sediments that have built up in the bays of Puget Sound. He also talks about the sediments found on the coast of Washington and Oregon.

\*Bretz, J Harlen. "The Spokane Flood beyond the Channeled Scablands." *Journal of Geology* 33 (February-March 1925): 97-115. **(JS)**

Bretz talks about the path of the flood from after it exited the Channeled Scablands to when it reached the Pacific Ocean. Bretz describes this flooding widening and changing the valleys of both of these rivers. The flooding along the Snake River then merged with the Columbia sending all of the water towards the Pacific Ocean.

\*Bretz, J Harlen. "The Spokane Flood beyond the Channeled Scablands. II" *Journal of Geology* 33 (April-May 1925): 236-259. **(JS)**

Bretz follows the course of the flood detailing erosional and depositional effects on each part of the Columbia River. In the second part of this article, the focus is solely on the Columbia and the Willamette Valley, Oregon as the merging of the Snake and the Columbia rivers is covered in the first part.

\*Bretz, J Harlen. "The Spokane Flood: A Reply." *Journal of Geology* 35 (July-August 1927): 461-468. **(JS)**

Bretz often attacked his critics by name, but he didn't usually devote an entire article to one critic. For reasons that are not entirely clear, he decided to do this with Edwin T. McKnight, a geologist working for the U. S. Geological Survey. McKnight was a proponent of the theory that the Columbia River had in fact been diverted into the Channeled Scablands by an ice dam.

\*Bretz, J Harlen. "The Terminal Moraine of the Puget Sound Glacier." *Journal of Geology* 19 (February-March 1911): 161-174. **(JS)**

Another early Bretz article from his time researching the glacial geology of Puget Sound. In this essay Bretz writes about Ice Age Glaciers and how far they extended into Puget Sound.

\*Bretz, J Harlen. "Valley Deposits Immediately East of the Channeled Scabland of Washington. I" *The Journal of Geology* 37 (July-August 1929): 393-427. **(JS)**

The area alluded to encompasses Southeastern Washington, as well as small parts of Oregon and Idaho. Most significantly for Washington State this area includes the Palouse Hills. The article is extensive, because the geographic area focused on includes many small valleys. On top of that, the Ice Age Floods created many new spillways which no longer exist.

\*Bretz, J Harlen. "Valley Deposits Immediately East of the Channeled Scabland of Washington. II" *The Journal of Geology* 37 (August-September 1929): 505-541. **(JS)**

The second part of this article tracks the many new streams created by water from the Channeled Scablands. Although lacking any significant erosion from the flood, areas like the Palouse contain a lot of sediment carried from the Scablands.

\*Bretz, J Harlen. "Valley Deposits Immediately West of the Channeled Scabland." *Journal of Geology* 38 (July-August 1930): 385-422. **(JS)**

To the east of the Channeled Scablands the flood water had a much larger area to flow into, while to the west of the Scablands there was the Cascade Mountains blocking any flood water from reaching Puget Sound. In spite of this, there was still flooding and erosion on land near the Columbia River Valley.

Joseph Pardee Articles

\*Baker, Victor R. "Joseph Thomas Pardee and the Spokane Flood Controversy." *GSA Today: A Publication of the Geological Society of America* 5 (September 1995): 169-172. (JFK-MLP)

This article provides a brief but detailed summary of Pardee's role in the Spokane Flood Controversy and how his discovery of Glacial Lake Missoula played a role in the Spokane Flood Controversy, which ran concurrent to his research into Glacial Lake Missoula.

\*Fuchs, Robert L. "GSA Beneficiary of the Pardee and Kelly Estates." *GSA Today: A Publication of the Geological Society of America* 5 (September 1995): 169-172. (JFK-MLP)

Written shortly after the death of Mary Kelly a close friend of Pardee and owner of his estate. The financial holdings of this estate then passed to the Geological Society of America who used it to create the Joseph T. Pardee Memorial Fund. This article talks about the fund and the significance of Pardee's work.

\*Pardee, Joseph T. "Glaciation in the Cordilleran Region." *Science* 56 (December 1922): 686-687. **(JS)**

An interesting crossover that occurred between Pardee's and Bretz's research is documented in this article. In what is more of a brief notice than a full length article, Pardee announces the discovery of evidence in Central Washington that of glacial erosion extending into Central Washington; Pardee's evidence was in fact leftover erosion from the Ice Age Flooding.

\*Pardee, Joseph T. "Ripple Marks (?) in Glacial Lake Missoula." *Bulletin for the Geologic Society of America* 51 (1940): 2028-2029. **(JFK-MLP)**

In this one page notice, Pardee first points out the evidence of a massive release of water from Glacial Lake Missoula. It is a brief summary of new evidence that Pardee would elaborate on in a full length article a few years later.

\*Pardee, J. T. "The Glacial Lake Missoula." *The Journal of Geology* 18 (May-June 1910): 376-386. **(JS)**

Pardee did the majority of his research on Glacial Lake Missoula a decade before he discovered the glacial lake had broken its ice dam. Pardee describes that traces of a glacial lake left in the area surrounding Missoula, he accurately describes that shape of the lake and its exact location; finally he accurately describes the location of the ice dam.

\*Pardee, J. T. "Unusual Currents and Glacial Lake Missoula." *Bulletin for the Geologic Society of America* 53 (1942): 1569-1600. **(JFK-MLP)**

In this article, Pardee describes his discovery of a massive outpouring of water from Glacial Lake Missoula in the direction of the Columbia Plateau. Although Pardee stops his flood narrative at the Clark Fork Valley, it is fairly obvious that from there the water would have headed in the direction of the Channeled Scablands.

#### Otis W. Freeman Articles

\*Freeman, Otis W. "Apple Industry of the Wenatchee Area." *Economic Geography* 10 (April 1934): 160-171. **(JS)**

In this article, Otis W. Freeman focuses on the human geography of the apple industry in the Wenatchee Area in North Central Washington. As with many Freeman articles, apple farming is described in the context of its geographical distribution. Freeman begins with the geographical distribution of the farms before describing the influence of the apple farms on the natural geography of the Wenatchee Valley.

\*Freeman, Otis W. "Economic Geography of the Hawaiian Islands." *Economic Geography* 5 (July 1929): 260-276. **(JS)**

Freeman describes the distribution of agriculture on the Hawaiian Islands. Freeman begins by describing the overall natural geography of the Hawaiian Islands, before going on to describe each crop in detail.

\*Freeman, Otis W. "Hop Industry of the Pacific Coast States." *Economic Geography* 12 (April 1936): 155-163. **(JS)**

In yet another article merging agricultural industry with natural geography, Freeman focuses on the Hop Industry in California, Oregon, Washington, and Alaska. For Washington State, Freeman focuses on the hop industry of Yakima Valley.

\*Freeman, Otis W. "Human Relations to Northwest Geology." *The Scientific Monthly* 46 (February 1938): 150-156. **(JS)**

Instead of a Natural Geographer like Stradling, or a Geologist like Bretz and Pardee; Freeman was a Human Geographer. Most of this article is about the natural geography of the Pacific Northwest, with an introduction about how human communities are influenced by the natural geography of the area.



\*Freeman, Otis W. "Land Utilization in the Scablands of Eastern Washington." *Economic Geography* 7 (January 1931): 28-40. **(JS)**

In this article Freeman talks about the various types of soil that exist in the Channeled Scabland region and how it has influenced the use of the land by humans. As with all of Freeman's Channeled Scabland articles, he references Bretz and his flood theories when most scientists dismissed them.

\*Freeman, Otis W., J. D. Forrester, and R. L. Lupper. "Physiographic Divisions of the Columbia Intermontane Province." *Annals of the Association of American Geographers* 35 (June 1945): 53-75. **(JS)**

This is mostly a natural geography article that was co-written by Freeman and two other others. The "Columbia Intermontane" refers to the geographic region known as the Inland Northwest, between the Cascades and the Rocky Mountains, including the Channeled Scablands. Freeman does not bring up the flood theory in this article but he does refer the reader to the articles Bretz wrote on the Channeled Scablands.

\*Freeman, Otis W. "Natural Resources and Urban Development." *The Annals of the American Academy of Political and Social Science* 242 (November 1945): 30-45. **(JS)**

This article is not focused on a particular geographic location, but on the natural resources that led to the creation of cities and towns throughout America.

\*Freeman, Otis W. "Salmon Industry of the Pacific Coast." *Economic Geography* 11 (April 1935): 109-129. **(JS)**

Another Freeman article on a human economy and the natural geography that supports it. In this instance Freeman almost crosses the line from human geography to history, as he spends a lot of time talking about the systems of labor that support the salmon industry.

\*Freeman, Otis W. "The Pacific Northwest Pea Industry." *Economic Geography* 19 (April 1943): 118-128. **(JS)**

The geographic focus is the pea industry in Pacific Northwest. Freeman focuses on the pea industry in the Palouse region of Washington and Idaho, as well as the Blue Mountains region of Washington and Oregon.

\*Freeman, Otis W. "The Recession of Lyman Glacier Washington." *The Journal of Geology* 49 (October-November 1941): 764-771. **(JS)**

This is one of the few Freeman works focused entirely on natural geography, as supposed to human geography. The focus of the article is the Lyman Glacier, located on Chiwawa Mountain, in the Cascade Mountain Range. Freeman talks about the slow retreat of the glacier from the late nineteenth century to the publication of this article.

\*Freeman, Otis W. "The Snake River Canyon." *Geographical Review* 28 (October 1938): 597-608. **(JS)**

The focus of this article is The Snake River Canyon in the Channeled Scablands. The first half of this article talks about the geologic formation of the canyon, including the Ice Age Flood Theory, although this time there is no mention of Bretz. The second half of the article focusing on the mining industry that built up around the discovery of gold along the Snake River, as well as ranching.

\*Martin, Howard H. "Otis Willard Freeman 1889-1964." *The Journal of Geography* 63 (December 1964): 332. **(JFK-MLP)**

Obituary for Otis W. Freeman, although published in an academic journal instead of the more typical newspaper.

#### Thesis/Dissertations

\*Freeman, Otis Willard. "Human Geography of the Scablands of Eastern Washington." PhD diss., Clark University, 1929. **(JFK-ASC)**

In about five hundred pages Freeman describes the formation of the Scablands through lava flows and later flooding. Freeman then discusses the human history of the Scablands, from the earliest evidence of human inhabitation to the early 20th century. At a time when most of the scientific community was condemning Bretz theories, Freeman enthusiastically supported the idea of an Ice Age Flood.

#### Online Material

\*EWU. "Dale F. Stradling Photograph Collection," Eastern Washington University Libraries Digital Collections. <http://econtent.library.ewu.edu> (accessed, October 14, 2011). **(JFK-LDA)**

These are online copies of images from the Dale F. Stradling Papers and the Dale F. Stradling Photograph Collection. The online photos are all images Stradling took as part of his Channeled Scablands research. Most of the photos

are taken by Stradling himself, although there are a few commercially bought images.

\*EWU. "Otis Willard Freeman Photograph Collection," Eastern Washington University Libraries Digital Collections. <http://econtent.library.ewu.edu> (accessed, October 14, 2011). **(JFK-LDA)**

These are online copies of images from the Otis W. Freeman Photograph Collection. The online photos are all images Freeman took as part of his Channeled Scablands research. Most of the photos are black and white, although some are from originals that have been hand colored.

## Secondary Sources

### Books

\*Allen, John Eliot. *The Magnificent Gateway: a Laymen's Guide to the Geology of the Columbia River Gorge*. Forest Grove: Timber Press, 1979. **(JFK-ASC)**

This is a very informative guide to the geologic processes which shaped the Columbia River Gorge, as well the Channeled Scablands in general. The author very effectively communicates complex geological concepts to a general audience.

\*Allen, John Eliot and Marjorie Burns and Sam C. Sargent. *Cataclysms on the Columbia: a laymen's guide to the features produced by the catastrophic Bretz's Flood's in the Pacific Northwest*. Portland: Timber Press, 1986. **(JFK-ULBS)**

This book is divided into three overall sections, the first section talks about the discovery of the Ice Age Floods, the second section talks about the natural history of the Channeled Scablands, and the final part is a guide to the course of the flood from Missoula to the Pacific Ocean.

\*Alt, David D. *Glacial Lake Missoula and its humongous floods*. Missoula: Mountain Press Publishers, 2001. **(JFK-ULBS)**

This covers the history of the discovery of Glacial Lake Missoula by Joseph Pardee, focusing on how he determined that the lake had broken through its ice dam. The book then has a history of the work of Joseph Pardee and J Harlen Bretz, showing how the work of these two geologists came together to prove that there had been a massive Ice Age Flood.

\*Baker, Victory R., eds. *Catastrophic Flooding: the Origin of the Channeled Scabland*. Stroudsburg: Dowden, Hutchinson, and Ross, 1981. **(JFK-ULBS)**

The book is a compilation of some of the key articles in the Channeled Scabland debate. This book contains some of the articles that Bretz wrote for *The Journal of Geology*, two journal articles from two of Bretz's critics (I. S. Allison and R. F. Flint), the article where Joseph Pardee published his discovery of a glacial lake outburst flood, and two articles written and co-written by Bretz expanding his theories based on new evidence.

\*Bjornstad, Bruce N. *On the Trail of the Ice Age Floods: A Geological Field Guide to the Mid-Columbia Basin*. Sandpoint: Koeke Books, 2006. **(JFK-ULBS)**

This book is important because it provides a modern look at the Ice Age Flooding and where current theories stand on the exact number and sequence of the Ice Age Floods.

\*Burr, Devon, Victor R. Baker, and Paul Carling. *Megaflooding on Earth and Mars*. Cambridge, UK: Cambridge University Press, 2009. (SL)

Although mainly about the science of megaflooding this source has some important information about the scientific debate over the phenomenon of megaflooding in the first 12 pages.

\*Dryden, Cecil. *Light for an Empire: The Story of Eastern Washington State College*. Spokane: C. W. Hill Printing Company, 1965. **(JFK-ULBS)**

This is a somewhat melodramatic, but still accurate biography of Eastern Washington University. At the time this book was published Eastern had been recognized as a state college four years earlier and was on a path to achieving university status. This book was published the same year that Stradling was hired and provides a look where Eastern was during that time.

\*Haag, Edmund V. *The Centennial Album: An Illustrated history of Eastern Washington University*. Cheney: Eastern Washington University Press, 1982. **(JFK-ULBS)**

Published on the hundredth anniversary of Eastern's founding, this book provides a somewhat simplified history of Eastern. This source covers Eastern's achievement of University status in 1977.

\*Meinig, D. W. *The Great Columbia Plain: A Historical Geography, 1805-1910*. Seattle: University of Washington Press, 1968. **(JFK-ULBS)**

Early work by renowned economic geographer Donald Meinig describing the early settlement and use of the Columbia Plain by American explorers. Important because like Freeman, Meinig ties geography of the Columbia Plateau to the human industries that it supported.

\*Mueller, Marge and Ted Mueller. *Fire, Faults, and Floods: a road and trail guide exploring the origins of the Columbia River Basin*. Moscow: University of Idaho Press, 1997. **(JFK-ULBS)**

For the most part this is a book length tour guide of interesting places along the path of the Channeled Scabland floods and the Pacific Northwest in general. It is a useful reference for learning about the rich history of the Channeled Scablands, before and after the Ice Age Floods. This is a valuable source on the science behind the Channeled Scablands. Not as high budget or as well known as the NOVA documentary on the Ice Age Floods, it is arguably a better presentation because it provides a greater volume of information.

\*Oliphant, Orin J. *History of the State Normal School at Cheney, Washington*. Spokane: Inland-American Printing Company, 1924. **(JFK-ULBS)**

Written when Eastern Washington University was still the Cheney State Normal School, this book provides a detailed history of the early life of the school. In the context of this project it shows the type of institution Eastern was when Freeman first joined the faculty. This book also shows how Freeman was an unusual hire for a Normal School. This is an important source for contextualizing the school that Otis W. Freeman was hired by in 1924 and why he was unusual for faculty at the time. In fact this book was published the same the same year he was hired.

\*Pitty, Alistair F. *Introduction to Geomorphology*. London: Methuen and Co, 1971. **(JFK-ULBS)**

This book provides an excellent introduction to the concept of geomorphology (geological transformation of the ground) as well as some of the basic principles. Geomorphology was the main focus of both Stradling and Pardee, and to a lesser extent Bretz.

\*Soennichsen, John. *Bretz's Flood: The Remarkable Story of a Rebel Geologist and the World's Greatest Flood*. Seattle: Sasquatch Books, 2008. **(JFK-ULBS)**

This book is a much a biography of Bretz as it is a history of the Channeled Scablands debate. The book ties Bretz's personality into the decisions he made regarding his career. It helps explain why he pursued his flood hypothesis so determinedly in the face of his colleagues' condemnation. This is a very important source because it provides an excellent look into the life of J. Harlen Bretz before, during, and after the controversy surrounding his Ice Age Flood Theory.

\*Webster, G. D., Victor R. Baker and Carl Gustafson. *Channeled Scablands of Eastern Washington: The Geologic Story of the Spokane Flood: a roadblog via Spokane-Coulee City-Vantage-Washtucna-Lewiston-Pullman*. Pullman: Washington State University Press, 1976. **(SL)**

This is a very brief 23 page publication that provides people interested in the Channeled Scablands with a tour that they can take by car. There are many stops and the tour is expected to last two days.

\*Williams, Hill. *The Restless Northwest: A Geological Story*. Pullman: Washington State University Press, 2002. **(JFK-ASC)**

This is a very comprehensive book on the formation of the lands that now comprise the Pacific Northwest. The scope of the book is the entire Pacific Northwest, but it does describe the Scablands in considerable detail.

#### Government Documents

\*U.S. Department of the Interior. U.S Geological Survey. *The Channeled Scablands of Eastern Washington: The Geologic Survey of the Spokane Flood*. Washington, DC: Government Printing Office, 1973. **(JFK-LLUGDS)**

This is a very brief, but very informative booklet from the U. S. Geological Survey. The booklet covers the formation of the Columbia Plateau as a basalt plane after millions of years of volcanic activity. After that the booklet moves on to the flooding from Glacial Lake Missoula and how that changed what used to be a mostly flat plain.

\*Weiss, Paul L., and William L. Newman. *The Channeled Scablands of Eastern Washington: The Geologic Story of the Spokane Flood*. Cheney: Eastern Washington University Press, 1989. **(JFK-ULBS)**

For the most part this source is a later reprint of the 1973 U. S. Geological Survey booklet described above. The difference is that while the creating agency is the U. S. Geological survey, this version was printed through the Eastern Washington University Press. A new addition is added on the end speculating on the possible presence of early humans during the Ice Age Floods.

#### Thesis/Dissertations

\*Bjornsted, Bruce N. "Sedimentology and Depositional Environment of the Touchet Beds, WallaWalla River Basin, Washington." master's thesis., Eastern Washington University, 1980. **(JFK-ULBS)**

This is important because it contains the research of another scientist who did a lot of work in the Channeled Scablands. This also is important because this scientist believed in a common alternative to the idea of multiple floods shaping the Channeled Scablands.

\*Glenn, Jerry L. "Late Quaternary Sedimentation and Geologic History of the North Willamette Valley, Oregon." PhD diss., Oregon State University, 1965. **(JFK-ULBS)**

This is important because Willamette Valley of Oregon, although not part of the Channeled Scablands was affected by the flood water as it made its way from the Scablands to the Pacific Ocean via the Columbia River.

\*Rigby, James G. "The Sedimentology, Mineralogy and Depositional Environment of a Sequence of Quaternary Catastrophic Flood-derived Lacustrine Turbidities near Spokane, Washington." M. A. thesis., University of Idaho, 1982. **(JFK-LLPM)**

James G. Rigby dissertation is focused on the materials that have been laid down by flood water throughout the Channeled Scablands. Rigby was writing at a time when geologists and geographers were trying to figure out the exact sequence of the floods.

### Videos

\*KSPS Public Television Spokane. *Sculpted by Floods: The Northwest's Ice Age Legacy*. DVD. Spokane, WA: KSPS Public Television, 2001. **(JFK-LLMV)**

This is a low budget, but very informative documentary about the geology of the Channeled Scablands and how Ice Age Flooding shaped the region. This documentary sticks to the geology of the Channeled Scablands and doesn't talk about the debate over the the Ice Age Flood Theory.

\*Jim Newman. *Ice Age Floods: Catastrophic Transformation of the West*. DVD. Portland, OR: Oregon Public Broadcasting, 1998. **(SL)**

This DVD contains two short documentaries on the Channeled Scablands and the floods which formed them. The first is a thirteen and a half minute documentary produced by Washington State University in cooperation with the National Park Service. This documentary consists of an overview of the path of the flood water and J. Harlen Bretz's theories. The second documentary is half an hour long and produced by Oregon Public Broadcasting. The focus of the second documentary is the effects of the floods on Oregon and the Willamette Valley.

\*WGBH Boston. *Mystery of the Megaflood*. DVD. Boston, MA: Canadian Public Broadcasting, Public Broadcasting Service, WGBH Video, 2006. **(JFK-LLMV)**

This documentary is probably the most known source for information on the Channeled Scablands. Unlike the KSPS documentary, this program is equally focused on the debate that Bretz was involved in, as well as the Ice Age Floods themselves. The only problem is it leaves out a lot of the subsequent research done after Bretz's initial work.



ACCESSION PROCESSING WORKSHEET

Record Group/Papers of <b>OTIS W. FREEMAN</b>	Accession No. <b>SPC 988-0293</b>
	Accession Date
Received From (Name) <b>GEOGRAPHY DEPT, ISLE HALL -</b> Address (Building, Room) <b>DALE F. STRADLING.</b>	
Transferred From Where <b>GEOG. DEPT MAP LIBRARY -</b> <b>BOXES STORED IN CLOSET.</b>	Transfer Date
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Physical Condition of Records <b>FAIR</b>	Volume Transferred <b>10.0 cuft.</b>

I. ACCESSIONING

Date By

1. Records Transmittal is completed and received
2. Check carton contents and labels with Transmittal
3. Make entry in ACCESSION & DISPOSAL REGISTER
4. Complete as much as possible ACCESSION DATA SHEET
5. Type and send to Donor:
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II. PRELIMINARY ARRANGEMENT & DESCRIPTION

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2. Rebox:  Hollinger  storage cartons (1 cu. ft.)  
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3. Make temporary box labels
4. Make preliminary inventory/container-folder list
5. Assign locations
6. Enter locations on "WORKING COPY" of Inventory/Transmittal
7. Enter locations on ACCESSION DATA SHEET

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III. REFINED PROCESSING

1. Refolder in acid-free folders/label folders
2. Arrange folders to level of:
3. Separate photographs, and/or:
4. Other:
5. Prepare Inventory (Box & Folder List)/Transmittal
6. Label boxes:  Accession No.  Location  
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*Books to Gift/Exchange.*

IV. TYPING, COPYING, PAPERWORK

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- 1. Type box labels
- 2. Type ACCESSION DATA SHEET
- 3. Type Inventory (Box & Folder List)/Transmittal
- 4. Photocopy Inventory/Transmittal: No. of copies: \_\_\_\_\_
- 5. Photocopy ACCESSION DATA SHEET: No. of copies: \_\_\_\_\_
- 6. Distribute Inventory/Transmittal:
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  - \_\_\_ ERA Agency
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- 7. Make Index entries:
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V. PROCESSING RESULTS:

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VI. OTHER INSTRUCTIONS: