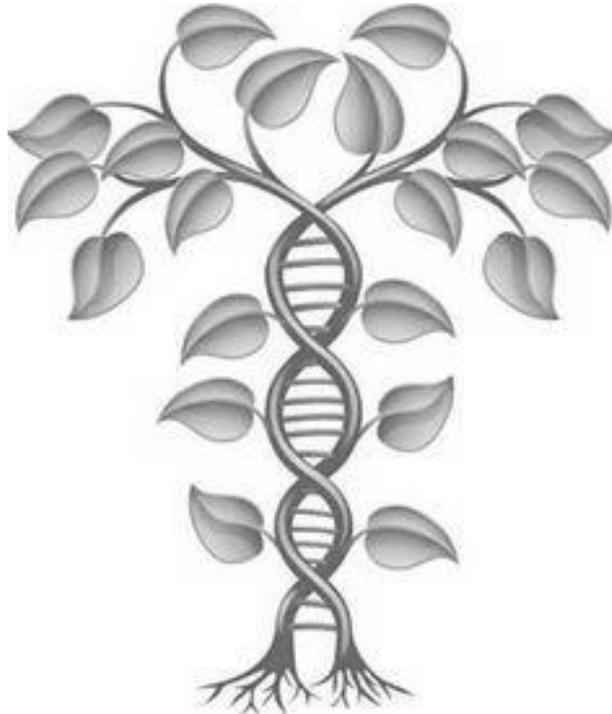


The University of Montana Western 12th Annual Research Symposium



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**April 13th and 14th, 2018
Charles G. Swysgood Technology Center
Great Room**

**Sponsored by
The Montana Western Biology Club
and
The Associated Students of the University of Montana Western
(ASUMW)**

The University of Montana Western 12th Annual Research Symposium

April 13th and 14th, 2018
Charles G. Swysgood Technology Center
Great Room

Schedule of Events

Friday, April 13th

3:15-4:00 pm..... Symposium Preparation and Poster Setup

4:00-6:00 pm..... Oral Presentation Session

4:00 – **Dr. Bill Janus & Steven Erickson** (Page 30)

Adolf Hitler, the NSDAP, and the *New York Times*

4:10 – **Baleigh Doyle** (Page 31)

Modeling Shopping Mall Incidents with a 3-Month Moving Average

4:20 – **Karie Favero** (Page 32)

An investigation of the effectiveness, reactions, and resistance to Nazi propaganda

4:30 – **John Allard and Sharon Williams** (Page 33)

Using sediment maps to understand fluvial sediment dynamics associated with in-channel, deformable structures

4:40 – **Madeline Glisson** (Page 34)

A Study of Human Nature through a Comparison of Roman Stoicism and Early Christianity

4:50 – **Sierra Bignell** (Page 7)

Hospitals in the Dominican Republic

5:00 – **Elizabeth Hanson** (Page 36)

Construct Validity of a Horse Personality Questionnaire

5:10 – **Kelsie Field** (Page 37)

2017 Summer as Hydrologic Technician for the United States Forest Service

5:20 – **Candice Dunagan** (Page 38)

5:30 – **Bobbi Irvin** (Page 39)

My Experience with the 2017 NIDA Summer Research Internship Program

5:40 – **Dennara Gaub and Michelle Anderson** (Page 40)

Flood-irrigated habitat loss and its potential impact migratory waterbirds in the Big Hole Valley.

6:00-7:00 pm.....Poster Session (pages 7-28) and *Hors D'oeuvres*

7:15-8:15 pm.....**Keynote Lecture**

“Plant interactions, soil biota, and the biogeography of exotic plant invasion “

Dr. Ragan Callaway, The University of Montana

8:15 pm.....**Reception**

Saturday, April 14th

Breakfast is provided

9:30 – 11:00 am.....**Oral Presentation Session**

- 9:30 – Sarah Benjamin** (Page 41)
Small Animal Rehabilitation: Aqua Therapy, Exercise, Massage
and Laser Treatment
- 9:40 – Kayla Adair** (Page 42)
Comparing and Contrasting Two Orthodox Religions
- 9:50 – Katie Bumgarner** (Page 43)
A Changed Perspective
- 10:00 – Devyn Christian and Aubrey Carpenter** (Page 44)
Cultural and ethnic diversity-based practices in international high
schools (Chief Sealth Int’l High School).
- 10:10 – Christina Hansen and Kyra Palmer** (Page 45)
Counting Collections for Math in Preschool and Kindergarten
Classrooms in the Seattle Public Schools.
- 10:20 – Lacey Knadler, Khali Knadler, and Halee Davis** (Page 46)
Compare and Contrast of the Different Religions in Our
Classrooms
- 10:30 – Megan Lombardi** (Page 47)
Religious Diversity in Seattle
- 10:40 – Edson Mendoza** (Page 48)
Why do people do bad things to others?
- 10:50 – Jason Bowman** (Page 49)

- 11:00 - Colter A. Feuerstein and Michelle L. Anderson** (Page 35)
A Stock Assessment of hatchery reared Rainbow Trout
(*Oncorhynchus mykiss*) in Ruby River Reservoir Montana

11:00-12:30 pm..... **Poster Session and Provided Lunch** (pages 7-28)

12:30 – 2:30 pm.....Oral Presentation Session

- 12:30 – George Lewis (Luke) (Page 50)**
The Architecture of the Afterlife: Constructing the Ethereal Realms of *The Divine Comedy*
- 12:40 – Courtney Anderson and Dr. Michael Gilbert (Page 51)**
A Novel Approach to Utilizing Spectroscopy for the Early Detection of *Borrelia burgdorferi* Transformants Plated Using Limiting Dilution.
- 12:50 – Jack Michael (Page 52)**
Limits of acceptable change for backcountry campsites in the Bob Marshall Wilderness Complex
- 1:00 – Brent Markee (Page 53)**
COINTELPRO: The Other Side of the 60's
- 1:10 - Bowden Colt Godfrey (Page 54)**
Highlights of a Fisheries and Information Intern with Montana Fish, Wildlife, and Parks.
- 1:20 –Mark L. McCombs (Page 55)**
A Machiavellian Analysis of Nationalism, Trump, and the 2016 GOP Primary
- 1:30 – Tyler Richardson (Page 56)**
Super Edge-Magic Labeling of Trees
- 1:40 – Shelby Smith (Page 57)**
Montana FWP Region 4 Wildlife Intern for the summer of 2017
- 1:50 – Larry Snellings Jr. (Page 58)**
The Cowboy of the Old West
- 2:00 – Chloe Worl (Page 59)**
My Internship at Barrett Hospital and Healthcare Laboratory and Pharmacy
- 2:10 – Falon Wofford (Page 60)**

Dr. Ragan Callaway

The University of Montana

Department of Biological Sciences

“Plant interactions, soil biota, and the biogeography of exotic plant invasion”

Biography

I am a community ecologist with a primary focus on plants. I am interested in how organisms interact with each other because the interactions can sometimes shed light on fundamental aspects of the natural world – for example do communities of organisms simply function as independent competing populations that happen to be mixed together, or do adaptation and evolution produce some degree of integration and interdependence among organisms? Much of my research has focused on “facilitation” among plants, interactions in which one species benefits, rather than competes with, other species. My work has been conducted in savannas, grasslands, salt marshes, shrublands, forests, deserts, and alpine systems. Another facet of my research focuses on exotic plant invasions. I am fascinated by biogeographic patterns in which relatively uncommon species in their native ranges become far more abundant in their non-native ranges. I have made efforts to quantify these patterns and have studied soil biota, allelopathic interactions, resource competition, herbivory, and disturbance in an effort to understand why some exotic species may become invasive. Most interestingly, the biogeographic transformation experienced by many exotic invaders suggests that natural communities may be shaped by evolutionary trajectories among species.

Abstract

Exotic, invasive species are those that when introduced to new habitats by humans, become much more abundant or dominant, and generally have strong negative effects on natives. Exotic invasion often has a clear biogeographical component, for example escape from specialist consumers by plants in their non-native range. Recent evidence suggests that escape from soil biota may also play an important role in many exotic plant invasions. Escape from soil biota is often manifest in much weaker “plant-soil feedback” interactions in non-native ranges than in native ranges, which appears to relax classic density-dependent population regulation. Finally, the biochemical effects of invaders can have stronger negative effects on many organisms in their non-native ranges than in their native range. These biogeographic differences suggest that regional trajectories of adaptation and evolution contribute to the organization of plant communities, including those we want to restore.

Poster

Abstracts

Hospitals in the Dominican Republic

Sierra Bignell

University of Montana Western

Biology

Abstract:

This past summer I was fortunate enough to travel to the Dominican Republic with a program called Gap Medics. On my four week trip I spent time in both the public and private hospitals in the area of La Romana. Students from all over the world and I followed doctors and surgeons in a different section of the hospital every week. I spent my first three weeks in the public hospitals of the DR. These hospitals are free for all citizens of the DR and are not funded near as well as the private hospitals. The private hospitals are used only by people who can afford insurance. In the public hospital, I spent my first week in OBGYN department, the next week in the emergency department, and then in general surgery. My last week there I shadowed doctors in the private hospital. We spent about 6 hours a day in the hospitals with the doctors. Most of them spoke pretty good English, but for those that didn't, we had a translator to explain more of what was going on. In our spare time we, explored the beaches and surrounding area and learned about the culture of the DR, as well as spending time each weekend at orphanages, playing and teaching the kids English. Once a week a doctor came to the house we stayed at and gave us a presentation on some of the diseases and cultural problems that citizens deal with. In my oral presentation, I will tell all about my experiences and how greatly the hospitals there differ from those here. I will use a power-point to show pictures of the hospitals, as well as some of the surgeries that I got to observe and one that I was actually able to scrub in on and assist. Overall the experience was amazing and opened my eyes to another culture.

Interdisciplinary field experience as a Conservation Aid Technician for the Nevada Department of Wildlife

Colton Brunson

The University of Montana-Western

Department of Biology

During the summer of 2016 and 2017, I worked for the Nevada Department of Wildlife (NDOW) as a Conservation Aid Technician in an internship co-sponsored by Nevada Bighorns Unlimited. Each season I was stationed out of field offices in both Northeast and Northwest Nevada. As part of this internship I worked with numerous NDOW wildlife, fisheries and habitat biologists throughout the state. A task that I assisted with on several occasions was performing bighorn sheep surveys. I utilized satellite data and radio telemetry to locate sheep, followed by surveys on the general health of the herd. This included recognizing early signs of pneumonia in both adults and lambs, and classifying rams by age to study herd population dynamics.

While working with fisheries biologists, I learned multiple population survey and management techniques related to several different fisheries. I performed backpack electroshock surveys for Lahontan cutthroat trout (*Oncorhynchus clarkii henshawii*). While performing gill net surveys for sport fish species, I learned how to properly set nets and effectively take measurement data from fish and watercraft operation/safety.

I worked on several water development projects with the habitat biologists. As freshwater sources are being depleted in Nevada, it is crucial for wildlife and habitat biologists to provide an artificial 'spring' habitats for wildlife in certain areas. These projects were greatly beneficial to be a part of because I was able to 'get my feet wet' while trying to understand the planning and permitting processes.

This internship solidified my thoughts on where my degree (BS Ecology, Fish and Wildlife Ecology Option) will take me. After working for NDOW, the drive that I possess to become a wildlife biologist has increased dramatically. I feel better prepared for the future because of the internship I was awarded.

Stochastic Modeling of Genetic Evolution in Small Populations for Sickle Cell Disease, Huntington's Disease, & Down Syndrome

Caitlyn B. Corso

The University of Montana Western

Departments of Psychology and Mathematics

This poster describes and discusses a stochastic model that incorporates the effects of genetic drift (Wright-Fisher model), mutation, and selection on genetic evolution within a small population. The model uses different parameters including population size, initial allele frequency, the selection coefficient, and both forward and backward mutation rates to estimate the effects of genetic evolution in a small population.

The model was used to investigate three genetic disorders: Sickle Cell disease, Huntington's disease, and Down Syndrome. Mutation and selection coefficients for each disorder were estimated from the literature and the model was used estimate the time to fixation for each disorder for a small population, as well as to examine relationship between population size and time to fixation.

Foraging Behavior of *Pogonomyrmex occidentalis* with a Stochastic Cellular Automata Model

Baleigh Doyle

The University of Montana Western
Department of Mathematics

The purpose of this research was to model the foraging behavior of *Pogonomyrmex occidentalis*. *Pogonomyrmex* are harvester ants who typically use pheromone trails to lead foragers to food sources up to 20 meters away [1, 2]. A stochastic cellular automata model (CAM) was constructed to model foraging behavior of this species and used to assess how different turning probabilities while searching and different distributions of food items (clustered or dispersed) would affect overall foraging efficiency. The mean number of food items returned to the nest per foraging bout was used as a measure of foraging efficiency. Based on a two-sample t-test, there was a significant difference between the mean efficiency for dispersed and clustered food items. The results suggest that *P. occidentalis* foraging behavior results in higher efficiency when food items are dispersed rather than clustered. Turn probabilities did not significantly affect foraging efficiency.

[1] Deborah Gordon. *Ants at Work: How an insect society is organized*. The Free Press, 1999.

[2] Bert Holldobler. Recruitment behavior, home range orientation, and territoriality in harvester ants, *Pogonomyrex*. *Behavioral Ecology and Sociobiology*, 1(1):3–44, 1976.

Creating Matlab Functions to Expedite Data Analysis

Baleigh Doyle

The University of Montana Western

Department of Mathematics

The project was to develop MATLAB functions to analyze participant response data from two in-house technical training programs (Technical Manager Training and Product Development Lead). The training workshops solicit participant feedback through surveys. The functions were created through MATLAB to analyze the response data for a specific program. The newly developed functions create box plots, bar graphs, and heat maps to represent the participant response data. The MATLAB functions allow users to effectively produce figures to analyze participant response data for the training programs in a fraction of the time previously required to complete the analysis using Microsoft Excel. The new data analysis technique allows the developmental team to provide reports in a shorter period of time.

What Goes On Underground: A Stochastic Model of Root Structures and Density in an Orchard

Jerry Ferris

The University of Montana Western

Department of Mathematics

A three-dimensional stochastic cellular automata model of root growth in a peach tree orchard was developed and implemented in MatLab. The model allows the larger structural root system to develop using the standard model of phyllotactic growth (used in L-system models of above-ground growth). The finer rootlet tip growth was modeled using a three-dimensional random walk modified by nutrient gradients in the soil reflecting a dynamic interaction between root growth and soil environment in which root tips grow faster in regions of higher nutrient concentration.

The MatLab code was optimized so that an entire orchard of root systems could be grown simultaneously and data were collected from the model using a sampling protocol developed for the experimental peach orchard at Utah State University. The density of the roots was measured by taking core samples at various distances from the tree trunks, selecting samples from each core at specific depths and measuring total linear length and total root biomass in each sample. Total linear length is the sum of all the lengths of all of the roots in a sample and the total root biomass is measured as volume of all roots in the sample for the cellular automata model (and the dry weight of all roots in the sample for field samples).

Data from the Utah State University experimental orchard (provided by Dr. Jennifer Reeve) was compared to data from the model orchard and found to have very similar root density profiles. The next step is to use the model orchard to design a more efficient long-term sampling strategy to assess root growth in response to nutrient gradients provided by application of compost and the growth of leguminous cover crops.

2017 Summer as Hydrologic Technician for the United States Forest Service

Kelsie Field

The University of Montana-Western
Environmental Science Department

During the summer of 2017 I, Kelsie Field, was employed by the United States Forest Service (USFS) as a GS-04 Hydrologic Technician. This position fulfilled the internship requirement for the Bachelors of Science: Environmental Science degree. As a seasonal employee for the USFS, I worked closely with various state and federal agencies, as well as private landowners, on projects related to native and invasive fisheries, threatened fish species, riparian vegetation, and stream habitat. This position was dynamic and included a variety of projects. Here, projects related to stream habitat and bull trout spawning habitat are discussed.

Bull trout are listed as a 'Threatened' species under the Endangered Species Act. The Beaverhead-Deerlodge National Forest houses streams that are used by bull trout to spawn. However, that spawning activity can be disturbed by excess sediment eroding into these streams from roads, campsites, and hiking trails. As part of a three-membered team, I, systematically documented potential erosion sites by traveling along USFS roads, mostly in the Anaconda-Pintler mountain range. We measured erosion depth, erosion length, presences and descriptions of buffers and vegetation to help determine best management practices for erosion sites. We worked together with crews from Phillipsburg, Montana to complete this project. More experienced members of the USFS used this data to implement prioritized management of the sediment erosion.

An inventory of stream habitat assessments were conducted as part of the Red Rock River stream survey project. Data from these assessments were compared to data collected by crews five to ten years previous. Discharge, flow, bank stability, bank angle, grazing observations, vegetation type as well as other attributes were measured and recorded for these streams.

The experience that I gained through this seasonal position allowed me to grow in my field data collection skills and learn how to effectively work with different entities to complete a project.

Stochastic Model of Malaria (*Plasmodium falciparum*) Spread in Yemen

Olivia FitzGerald

The University of Montana Western

Department of Mathematics

Malaria (*Plasmodium falciparum*) is a concern in many African and Middle Eastern countries. Yemen is a small country with a big malaria problem. Recent flooding and political chaos have not helped the situation. A stochastic SEIRS (Susceptible-Exposed-Infective-Recovered-Susceptible) model was developed to model malaria outbreaks across the entire country by modeling Yemen on a 10k grid using elevation, population density, and seasonal precipitation and temperature patterns. Within each cell of the grid, a cell-specific SEIRS model was run.

This model was run over several different political and epidemiological scenarios. The number of infected people varied with recovery rate and infection rate. Recovery rate was affected by political turmoil through increasing or decreasing availability of medical services. Infection rate changed with any increase or decrease in mosquito population numbers resulting from changing weather patterns or reduction in mosquito control efforts.

Internship at the Women's Resource and Community Support Center in Dillon, Montana
Elizabeth Hanson

The University of Montana – Western
Psychology Department

One-in-five women are sexually assaulted while in college (Muehlenhard, Peterson, Humphreys, & Jozkowski, 2017). The Women's Resource and Community Support Center in Dillon, Montana is a civic organization dedicated to advocacy for victims of sexual assault and domestic violence. An internship at the center afforded an opportunity to experience victim advocacy through attending court hearings, observing advocates meeting with clients, completing online victim assistance and domestic violence trainings, performing client centered administrative assistant duties, and directing the Make A Difference (MAD) Campaign. The MAD campaign consisted of an online survey as well as alcohol-serving establishment observational data collection pertaining to Dillon's alcohol consumption and sexual assault rates. Through my internship I have come to understand the roles of a victim advocate, particularly when navigating the justice system. This experience has validated my desire to become a victim advocate and has provided me with skills which I will use as my endeavors in the victim advocacy field continue.

Austin Jaynes

University of Montana Western
Environmental Sciences Department

Giant Springs State Park can be found in central Montana just outside of Great Falls. It is the most visited state park in Montana with over 400,000 visitors per year. My role as an intern at Giant Springs was to help the park ranger and supervisor inform visitors about the park through tours and answering questions at the ranger station. We also performed patrols to ensure everyone there was following park rules as well as do general maintenance. During late spring and early summer months the majority of visitors are school groups coming to tour the fish hatchery and the park. The children are all elementary school age and group sizes varied for each of the short nature walks given. Later months will see more people from out of state and locals. Little to no tours are given during these times unless scheduled to occur during an event. Knowledge of Giant Springs ranged from the history of what was in area before and how the park became what it is today. I also had to know the geology of how the water got to the spring and as well as the common living organism found in the park and Montana. Events such as National Trail Day allowed me to provide this information to the public. The interpretation, geology, and biology classes I took through Montana Western allowed for me to provide this information as accurately as I can to the various age groups. My last weekend as an intern I was required to create an event, a short bird viewing hike around the park, that required a few weeks of planning and an ability to identify some of the many birds found as well as learning how to use a bird viewing guide. This was done with the help of three members of the Upper Missouri Breaks Audubon. Being an intern with Giant Springs State Park furthered my interest in gaining a career with Montana Fish, Wildlife & Parks, however, I do not feel it will be in state parks.

Internship as a Wildland Firefighter for the U.S. Forest Service

Colton Johnston

The University of Montana-Western
Environmental Sciences Department

My internship over the summer was on a type-2 engine crew out of Darby/Sula Ranger District Bitterroot National Forest. Fire plays a major role in environmental ecology, but it needs to be managed so it will not harm people and property. Wild land firefighters are sent out to manage these fires. Firefighters manage the fire head on, whether it is from a helicopter to boots on the ground, digging line. My duty on the crew was to be safe, stay knowledgeable, help less experienced crewmembers; stay in peak physical condition, and to follow any other orders given. Many duties on a fire were given to me, being that I was one of the only B sawyers, -- I was certified to run a chainsaw on a fire, therefore one of the few that ran a chainsaw most of the time within our crew. I was also involved in digging line alongside my crewmembers with many different tools. The tools included a chainsaw, Pulaski, rhino, road hoe, combi, flapper, and backpack pump. The work on a fire could go on for multiple weeks to maybe just one day depending on the size and complexity of the fire. I learned a lot about what goes on within the fire world that the public doesn't know about or understand. It can be hard, miserable work but the feeling of satisfaction I got when what I did saved a house, or thousands of acres of land from burning overcame any negative feelings. Many classes taken at the University of Montana Western helped me through the internship. Botany being the most helpful, knowing how plants interact with their environment as well as how they react with fire is beneficial to the crews around me.

A Stochastic Life-History Model of the Effects of Melting Sea Ice on the Coastal Population of Polar Bears (*Ursus maritimus*) along the Northern Beaufort Sea

Joseph Joyce

The University of Montana Western
Department of Mathematics

A four-stage (cub-yearling-subadult-adult) stochastic life-history model of the polar bear (*Ursus maritimus*) was constructed using stage-specific mortality parameters measured from the coastal population along the northern Beaufort Sea. Mortality estimates were available from 1971 to 2006 and based on capture-recapture methods. Estimates of the percentage of open seawater (versus ice cover) over the coastal portion of the northern Beaufort Sea were available from satellite imaging starting in 1979 (National Snow and Ice Data Center). Regression modeling was used to predict mortality rates from the percentage of open seawater using the data from 1979 to 2006. The stochastic life-history model was used to assess long-term polar bear population levels in response to predicted increase in the percentage of open seawater due to climate change.

A Modeling Approach to Understanding Goshawk Ecology in Southwestern Montana
Jarred Kvamme, Dr. Eric Dyreson, and Dr. Jack Kirkley

The University of Montana Western
Departments of Biology and Mathematics

The Northern Goshawk (*Accipiter gentilis*) is a large raptor that nests in the forests of the Western Montana. Goshawks are known to be highly selective in their choice of nesting sites and often return to the same nesting territories year after year. Over the last 20 years, Dr. Jack Kirkley has systematically collected forestry data (on variables such as nest tree age, height, canopy cover, etc.) measured at goshawk nest sites and randomly selected locations with no goshawk nests.

Using these data, we conducted three phases of analysis: (1) identification of the forestry variables important to goshawk nest site selection; (2) landscape-level mapping of potential goshawk nesting habitat; and (3) construction of a stochastic individual-based life-history model of goshawk population dynamics.

(1) Identification of forestry variables important to nest site selection was conducted using both univariate and multivariate statistical analyses comparing data collected at nest sites versus randomly selected locations. Randomly selected locations were chosen to lie within the same altitudinal range and forest type as active nest sites. From these analyses, a probabilistic behavioral model of nest site selection was constructed.

(2) Landscape-level mapping of potential goshawk territory was conducted by applying the probabilistic behavioral model over a GIS landscape (incorporating digital elevation, surface water, land cover, and Landsat data, etc.) in order to construct a likelihood-surface map giving the probability of nest site selection at each point in the landscape.

(3) A stochastic individual-based life-history model (IBM) of goshawk population dynamics was constructed to assess whether the region under study is predicted serve as a long-term source or sink in regional population dynamics under models of predicted climatic change and habitat loss. The model was constructed using life-history parameters from the literature, weather patterns from the PRISM database, run over the GIS landscape from (2) using the behavioral model of nest site selection from (1) and validated using territory occupancy and productivity data collected by Dr. Kirkley.

This research was supported by the NASA-Montana Space Grant Consortium ARES Grant for undergraduate research.

Pre-restoration characteristics of critical high elevation mesic sites within mountain big sagebrush

Sharon Williams, John Allard, Lydia Landau

The University of Montana Western

Environmental Science Department

Geo 421: Hydrology 2017

In order to increase soil moisture, expand mesic vegetation, enhance the abundance of forbs and insects for sage-grouse broods and influence songbird populations, the Montana Chapter of the Nature Conservancy, supported by local and federal agencies, is attempting to restore sage-grouse brood rearing habitats in stands of mountain big sagebrush near mesic meadows, seeps and first-order streams immediately downslope of melting snowfields by utilizing rock/brush structures. Limited data, however, exist to inform placement of structures, particularly in high-elevation, snow-melt dominated, mountain big sagebrush basins. Our goal was to develop an initial understanding of soil characteristics, underlying geology, and snowpack, unique to the restoration areas in southwest Montana, to inform the prediction of hydrological responses and aid in understanding project effectiveness. Our work contains field observations, completed by hydrology students at the University of Montana Western, as well as soil reports, geologic maps, and satellite images of persistent snowpack in and near restoration areas for establishing baseline data on which to build future monitoring. Our work is supporting a large interagency effort, partially funded by the National Fish and Wildlife Foundation, for cross-boundary conservation of critical high-elevation mesic sites within mountain big sagebrush benefiting rural economies and enlarging resilient habitat for sagebrush obligate-birds.

The Application Of Tree Ring Chronologies As A Tool To Understand Past And Present Climate

Cassie Mann and Spruce Schoenemann

The University of Montana Western

Environmental Sciences Dept.

Environmental Geochemistry

This study focuses on tree ring chronologies as the link between modern climatic trends and paleoclimate reconstructions that have been derived from lake sediment samples in the Northern Rocky Mountains. Studies of tree rings yield indirect information on precipitation and temperature trends over the life of the tree, and these records may span a few decades to hundreds of years. This allows scientists to extrapolate climatic conditions over a region from long before historical observations began to be collected. Records of snowfall, drought, forest fires, temperature and precipitation have been reconstructed using data collected from tree ring samples. The exact relationships between these factors depend on the location and species of the specimen. We collected twenty samples from *Pseudotsuga menziesii* in the vicinity of Brownes Lake, Montana in February 2018. A subsample of tree rings is examined to provide a preliminary analysis of local climate. *P. menziesii* is highly drought resistant; therefore, these samples can be used as indicators of extreme or extended drought, or a general shift toward a drier climate. We are especially interested in the effect of snowpack on growth, because snowpack is an extremely important source of water in our mountainous ecosystem. Due to fire prevalence and cold winters temperatures, individual *P. menziesii* are unlikely to live past 400 years in this region. Although none of our tree cores provide records beyond ~1760 AD, data from other studies have been used to reconstruct snow water equivalent for the greater Missouri Headwaters region back to the mid 1300s. These data show similar trends to observed localized SWE over the last century from SnoTel stations. As part of the research project entitled Precipitation Isotope Ratios and Tree-ring based Snowpack Relationships to inform Paleoclimate Reconstructions from Lake Sediment Cores, funded by the Montana Space Grant Consortium, we aim to use collected tree ring chronologies in conjunction with longer records supplied by snowpack dominated $\delta^{18}\text{O}$ lake sediments to reconstruct an approximation of regional hydroclimate compared with modern precipitation and SWE to project future climate trends in the coming decades, thus informing natural resource management decisions.

Author: **Cody Mock**
The University of Montana Western
Environmental Science Department

Noxious Weed Mapping and Control

The state of Montana has 35 noxious weed species that can beat out native plants, create habitat loss for Montana's wildlife species, decrease grazing land for cattle and decrease cropland within the state. Identification, mapping and eradication of these noxious weeds is important in protecting Montana's rangeland and native plant species. My position with Terranova LLC was to identify the species of noxious weed present, map the area that the plant is present in and select the best chemical mixture to kill the plant while not contaminating the water, soil, or surrounding plant and animal life in south west Montana. The main species that we encountered were Canadian Thistle, Spotted Knapweed, Hounds Tong, White Top, and Leafy Spurge. Once we identify the species of noxious weed we map the area using the MapItFast app. Some of the herbicides that we use like Milestone, Tordon, and 24D are growth regulators that cause the cells within the plants to elongate quicker than the plant can naturally grow causing them to burst and the plant to die. We also use herbicides such as Glifosate which stops the plant from producing lipids which stops metabolic processes within the plant. Some stop the production of fatty acids causing the plants to die. Adjuvants like R11 allow the herbicide to bond with the water molecules. We also use drift controllers and seed oil penetrators to kill the seed bank that is built up within the soil. When it comes to seeing results you can see the initial impact when the plants are drooped over and dying. When it comes to seeing the seed bank results, it is a year to year observation of the area based on the map size. If the map from the year before is larger than the current years map they the seed bank is decreasing.

Facilitation and community dynamics in sagebrush steppe of the Intermountain West

Jazzmyn Mullen and Wendy Ridenour

The University of Montana Western

Biology Department

Sagebrush steppe communities of the Intermountain West in North America are characterized by intense abiotic stress, and are also under increasing pressure due to anthropogenic threats including fire suppression and livestock grazing. Plant community dynamics are determined by patterns of recruitment and mortality, which are responsible for the flux of individuals across the landscape over time, while complex combinations of positive and negative interactions such as competition and facilitation ultimately determine the structure of plant communities. We investigated the strength of facilitation and the dynamics of sagebrush steppe communities in this context and hypothesized that the cooler climate of Glacier National Park would lead to weaker positive interactions among sagebrush steppe plants and that facilitative interactions would be more important in the more stressful (warmer and more arid) climate of the Beaverhead Deerlodge National Forest to the south. We found that significantly more grasses and forbs grew within *Artemisia tridentata* spp. *wyomingensis* canopies than in the open grassland outside of shrub canopies at both sites. The mechanism of facilitation may be increased shade and hydraulic redistribution by *Artemisia* under its canopy, as soil water content was significantly greater at both sites underneath *Artemisia* canopies. In open grassland between *Artemisia* shrubs, the soil was characterized by approximately 25% cover of cryptobiotic soil crusts. *Artemisia* seedling recruitment was significantly associated with cryptobiotic soil crust cover. Biological nitrogen fixation by cyanobacterial components of cryptobiotic soil crusts may be the facilitative mechanism. Results of our laboratory assays of cryptobiotic soil crust suggest that under a broad range of natural field temperatures and moisture conditions, sagebrush steppe biological soil crusts are able to fix a significant amount of nitrogen. Additionally, recruitment of *Pseudotsuga menziesii* seedlings and saplings found encroaching into our sagebrush steppe study sites was significantly associated with *Artemisia* canopies. Our results suggest that over time, the sagebrush steppe will increasingly give way to a much more homogenous cover dominated by *Pseudotsuga* forest.

My Internship as a School Counselor

Taijah Peterson

University of Montana Western
Psychology Department

During the Fall 2017 semester, I interned for a school counselor at the Four Georgians Elementary School, in Helena Montana. I took this internship to help me decide if a school counselor is something that I would like to peruse a career in and pursue a master's degree in. While doing my internship I was supervised by Mrs. Marshall who has been a school counselor for over ten years. While at the school I attended staff meetings and group meeting that involved children who the school counselor sees. I also was apart of the parent teacher conferences and sat in on those meetings. I also was able to sit in on some one on one counseling sessions when the children said it was okay. An elementary school counselor also teaches lessons to each grade level about social skills. The first week I just observed these lessons but by the last week I taught all the grade levels without help.

During my internship I gained many tools to help me become a great school counselor. I was able to talk to other school counselors in the district as well during all district meetings. I was also able to read up on how to write up a 504 plan and learn a lot about confidentiality. While doing this internship I also got certified in Bully Prevention. This internship helped me also go forth with applying to graduate school for school counseling.

Evaluating Montana mountain lion (*Puma concolor*) population dynamics using life-history modeling, migration, and habitat connectivity

Tyler Richardson

The University of Montana Western

Department of Mathematics

A stochastic life-history model was constructed to model Montana mountain lion (*Puma concolor*) population dynamics based on reproductive characteristics, initial populations, and mortality rates. Six population stages were used, with each stage determined every $\frac{1}{2}$ year using a binomial probability distribution (probabilities based on mortality rates) in each of the six difference equations for the six population stages. Due to their ability to migrate long distances, geographical information was used to determine available habitat for mountain lions and estimate habitat connectivity. Estimates of carrying capacity were derived from territory size estimates in the literature. Scenarios for mountain lion population dynamics based on higher mortality rates due to interaction with humans and decreasing habitat connectivity were evaluated.

Montana State Parks AmeriCorps – Combining national service with educational experiences and career growth.

Aaron Tuttle

University of Montana-Western
Environmental Science Department

During the summer of 2017 I was an AmeriCorps member at Pictograph Cave State Park, south of Billings, Montana. My experience with AmeriCorps and Montana State Parks has not only bolstered my knowledge of Environmental Interpretation/Parks & Recreation, but also given me a foot in the door with potential employers. During my 675-hour service term I led trail tours, outreached to the public, and maintained the park. My experience from Montana-Western's Environmental Interpretation program gave me a solid base for the position, since most other members came from a different background. I was fortunate enough to be mentored by the manager of the park, who is alumni of the University of Montana Western Environmental Science Department. This poster presentation will highlight the most empowering moments of my internship and how it helped prepare me for a career, as well as the importance of national service and respectful recreation on our public lands.

The Watershed Education Network Internship

Daniel Wight

The University of Montana Western
Department of Environmental Sciences
ENSVT Internship

The monitoring of watersheds through physical, biological and chemical parameters provides an array of data from various characteristics of any individual stream. The significance of these measurements is that we can determine, and monitor the over-all health of any particular watershed over time. We can understand the climate driven annual snow-pack and resulting spring run-off with both long-term historical data, and short-term monitoring. This is important both to the surrounding ecosystem of the stream, and to connected watersheds. Our continual monitoring of Rattlesnake Creek provides data from an important watershed that is a tributary of the Clark Fork River. Rattlesnake Creek provides groundwater recharge as well as direct water diversion for agriculture. Rattlesnake Creek also provides habitat and spawning for sensitive native fish species such as the threatened Bull Trout (*Salvelinus confluentus*). The Rattlesnake Creek dam however restricts fish access and additionally is no longer in use. The planned removal of the dam in 2019 by various federal and state agencies will address this ecological blockade. It's understandably necessary to collect data on the stream as the addition or removal of a dam can have significant effects on sedimentation and or erosion rates of any watershed. The data we collect will be used by state agencies such as The Montana Fish Wildlife and Parks and The Montana Department of Environmental Quality to assess the creek before and after the removal of the dam. The physical parameters of Rattlesnake Creek are monitored by setting up cross-sections perpendicular to flow and collecting data such as velocity, water depth, bank-full height, and substrate composition. The chemical parameters we monitor on Rattlesnake Creek include pH, temperature, and dissolved oxygen. The biological parameters consist of macro-invertebrate assessments. Additional duties include education on basic hydrologic concepts and the importance of watershed health to the general public. This is typically accomplished by public event booths, presentations, and taking school groups up Rattlesnake Creek to learn how watersheds are monitored.

The Montana Conservation Corps Internship

Daniel Wight

The University of Montana Western
Department of Environmental Sciences

The past and continued introduction of non-native plants is a major threat to the Rocky Mountain Region ecosystems. Invasive plants outcompete native plants and in doing so they reduce available forage, increase soil erosion, and intensify wildfires. A wide range of the invasive plants infesting the Rocky Mountain Region are also poisonous to wildlife, livestock, and people. Through a contract with the Nez Perce Watersheds and The Clearwater National Forest Service we inventoried, mapped, and treated over 30 different invasive plants in the Clearwater/Bitterroot-Selway National Forests. The inventory included vegetation assessments to determine site specific composition of non-native vs native plant species. The treatment methods of these sites depended on the invasive plant infestation level and species type. Treatment methods included manual removal, herbicide application, and competitive planting. The areas treated were mapped using ArcGIS software. Additional conservation work included aquatic wildlife relocation, willow planting, and erection of trail signs to educate forest recreationist on invasive plants. These additional assignments were typically done concurrently with specialists from either The Nez Perce Watersheds or Clearwater National Forest Service. The initial training necessary to complete these tasks consisted of two weeks which included Wilderness First Aid/CPR certification, handheld GPS/compass use, plant identification, herbicide mixing, storage, and application. After the initial two weeks of training was completed we then typically spent 8 to 9 days on assignments in various settings such as recreational use sites, logging roads, mine restoration sites, and backcountry trails throughout the Clearwater or Bitterroot-Selway National forests. We reported and transferred our data to the Nez Perce Watersheds out of the Powell Ranger Station at the end of every 8 or 9 days in the field.

Presentation

Abstracts

Adolf Hitler, the NSDAP, and the *New York Times*

Dr. Bill Janus & Steven Erickson

The University of Montana-Western

Department of History, Philosophy, and Social Science

HSTR 499

My Senior Thesis examines the *New York Times* and its coverage of Adolf Hitler and the NSDAP during the Weimar Republic. By analyzing and synthesizing every essay, report, opinion, and news article found in the *Times*, I will attempt to compare and contrast the *Times*'s coverage to what German historiography now indicates transpired in Germany before 1933. Questions I ask and answer from my research include: what did the American Press overlook in their coverage of Hitler and the Nazis; did the *Times* underestimate the popularity and political power of the Nazis; and did the *Times* influence the American public's view of Hitler and the NSDAP. In conclusion, my research shows that the *New York Times*, just like most other Germans at the time, underestimated Hitler and the NSDAP. They simply did not foresee the danger the Nazis posed to German democracy, Europe's Jews, and world peace.

Modeling Shopping Mall Incidents with a 3-Month Moving Average

Baleigh Doyle

University of Montana Western

Department of Mathematics

Shopping malls are places with an abundance of retail stores, diverse entertainment venues, and high foot traffic. Therefore, over time, these retail locations have become occasional targets of terrorist activity. This exploratory research studied sequences of these activities and their probability of occurring. A survey of the applicable literature provided a brief overview of terrorism in general and then, more specifically, a discussion of this development in the context of shopping centers. The data for this research were derived from the Global Terrorism Database, which is hosted and maintained by the University of Maryland. The method selected to investigate the aforementioned relationship was the Markov model. First results of the unique application of this model and the Global Terrorism Database revealed that the incidents occurred more frequently during the calendar months of December through January and July through September, after comparing the terrorism database information with an expected uniform distribution. A 3-month moving average model was created to forecast terrorist incidents for the next three months based on the average of the terrorist incidents of the past three months. The shopping mall data did not fit a uniform distribution, and the likelihood of incidents occurring was high during the month of June and then steadily declined until the month of November. This exploratory analysis contributes worthwhile information to the areas of mathematical modeling, consumer studies, security studies, and public policy.

An investigation of the effectiveness, reactions, and resistance to Nazi propaganda.

Karie Favero

The University of Montana- Western
History, Philosophy, and Social Sciences Department

An exploration of the relationships of both Germans and non- Germans in terms of resistance to Hitler and the Nazi party's effort to eradicate anything that did not fit into their volkisch ideals and their attempt of propaganda. Often this attempt included an almost complete annihilation of any creative expression that the Third Reich considered a threat to the party's principles. In this context, I explored the correlation of resistance to treason and patriotism and their relationship to race, religion, and ideology. The methods of resistance to propaganda investigated include jazz, degenerate art, and modernity. Jazz, especially within the Weimar era, became an avenue of resistance involving an unwillingness to conform to traditional musical values, an attempt at innovating the current music scene, and was loosely structured; counteracting all Nazi principles and practices. Degenerate art became a term used by Nazi propagandists to describe pieces that were deemed too modern for volkisch Germany or was an attempt of a cultural disintegration of the German people. The party later held an exhibit with hundreds of pieces of art in 1937 to showcase the non- German or corrupt pieces in order to disparage their artistic attempts and to combat any misleading ideas. Possibly one of the most confusing and contradictory methods of Nazi propaganda was the effort to eliminate any thought of modernity. On one hand, they made significant attempts to be out front in scientific discoveries and research. On the other, they discouraged any outlying modern minds or contradictory ideas. Through my research and exploration into the effectiveness, reactions, and resistance to Nazi propaganda, I have been able to draw many parallels between various historian's conclusions and my own.

Using sediment maps to understand fluvial sediment dynamics associated with in-channel, deformable structures

John Allard and Sharon Williams

The University of Montana Western
Environmental Science Department
Geo 421: Hydrology 2017

In the snowmelt dominated watersheds of southwest Montana, channel incision is degrading stream health and riparian habitat. Incision can result in: 1) loss of meandering, thus increasing velocity and decreasing aggradation 2) lowered channel and water table elevation 3) loss of stream connectivity with the floodplain 4) reduction of riparian vegetation, leading to bank instability and sediment contribution, increased water temperatures, and habitat loss. Installation of structures that intentionally alter fluvial processes has been successful in reconnecting channels to floodplains. Channel elevating riffle-grade-control-structures (RGCS) were installed by The Nature Conservancy (TNC) and partners on Long Creek in the Centennial Valley of southwest Montana in late August of 2016. Brush structures, built primarily from on-site materials such as conifer and willow, were installed along Robb Creek, a tributary of the Ruby River in southwest Montana, in 2015 and 2017. The goal of RGCS's and brush structures is to create riffle-pool morphology, encouraging sediment storage upstream and increased velocity downstream, ultimately promoting aggradation through induced meanders and re-establishing floodplain connectivity. Broader floodplains, elevated channels and longer water residence times increase infiltration, potentially increasing groundwater storage and enhancing late summer discharge. The University of Montana Western's 2017 Hydrology mapped sediment within the channels of both creeks to determine how the structures are impacting channel morphology and hydrologic function. On Long Creek, we compared mapped sediments to pre-installation data from one year prior. We found an increase in fine grain sediments and riparian vegetation in the channel, and an areal reduction of gravel. On Robb Creek, our mapping provided pre-installation baseline data to assess impacts of the brush structures installed during, and following, our project work.

A Study of Human Nature through a Comparison of Roman Stoicism and Early Christianity

Madeline Glisson

University of Montana-Western

Department of History, Philosophy, and Social Sciences

The complexities of the Roman Empire, including; its longevity, geographic size, and its political impact on conquered cultures and societies, allowed for ideas, histories and religions to be fused across Western Europe and the Mediterranean world. Originating in Greece, Stoicism was already an established philosophical school when it reached the city of Rome. Romans however infused their culture into the philosophy allowing it to evolve into Roman Stoicism. This new philosophical school elevated ethical and moral concepts found in Stoicism, teaching that an ever-present divine force kept people in connection to the divine through logical reasoning. Also, around this time Romans were being exposed to, and adopting a new faith, Christianity, with its own set of evolving ethical and moral concepts. My research examines Stoic and Christian ethics and morality. Both of these intellectual systems developed in contrasting cultures and centuries apart. Yet Roman society connected these schools in many ways. By evaluating the two ideologies the ethical and moral teachings of Roman Stoics and early Christians show that they believed humans to be rational beings through the logic given to them by divine power.

A Stock Assessment of hatchery reared Rainbow Trout (*Oncorhynchus mykiss*) in Ruby River Reservoir Montana

Colter A. Feuerstein and Michelle L. Anderson

The University of Montana Western

Biology Department

This research project will provide reservoir fishery management recommendations to Montana Fish, Wildlife & Parks with the intent of increasing angler satisfaction for Ruby River Reservoir. This study will examine the optimization of yearly stocking rates of hatchery reared rainbow trout. Six years of gillnetting data from Ruby River Reservoir will be analyzed to discover if rainbow trout metrics (catch per unit effort (CPUE), relative weight (W_r), and growth rates) are related to each other and to stocking practices. When analyzing length and age data, we noticed that rainbow trout in the reservoir are experiencing slow growth and are dying before the age of four. The age and growth rates of rainbow trout in the reservoir will be determined by analyzing otoliths. Age and growth increment data will be combined to back-calculate length at age measurements for individual fish. Several scenarios will be analyzed to determine a stocking strategy that optimizes CPUE, W_r , age, and growth for the reservoir fishery. If modifying stocking practices can enhance rainbow trout growth rates and longevity, then it is probable that angler satisfaction will be positively affected. Overall, this would provide suggestions for rainbow trout management intended to increase angler satisfaction in Ruby River Reservoir.

Construct Validity of a Horse Personality Questionnaire

Elizabeth Hanson

The University of Montana – Western
Psychology Department

Though horses were domesticated 4,000 years ago, evidence suggests humans have been formally plumbing the depths of the relationship for at least 2,300 years. More recently, equestrians have attempted to codify the investigation, in part, through the use of structured equine behavior evaluation and assessment tools. The goals of this psychometric approach include the ability to describe, explain, and predict equine behavior on one level, and to gain insight into temperament characteristics or traits underlying the behavior of interest on another level. One such assessment tool is the Horse Personality Questionnaire, which purports to describe five different personality traits. While enjoying widespread use, it has not been evaluated for its psychometric properties. The purpose of this study was to conduct a factor analysis of the Horse Personality Questionnaire to determine the actual factor structure.

2017 Summer as Hydrologic Technician for the United States Forest Service

Kelsie Field

The University of Montana-Western
Biology Department

During the summer of 2017 I, Kelsie Field, was employed by the United States Forest Service (USFS) as a GS-04 Hydrologic Technician. This position fulfilled the internship requirement for the Bachelors of Science: Biology degree. As a seasonal employee for the USFS, I worked closely with various state and federal agencies, as well as private landowners, on projects related to native and invasive fisheries, threatened fish species, riparian vegetation, and stream habitat. This position was dynamic and included a variety of projects. Here, projects related to invasive and native fish, as well as riparian vegetation health are discussed.

In collaboration with Montana Fish, Wildlife and Parks as well as the Bureau of Land Management, the Beaverhead-Deerlodge National Forest Hydrology crew was tasked with inventorying several reaches of stream in Brays Canyon. As part of this project, fish were electroshocked and the species identified. Invasive brook trout were eradicated after identification and native westslope cutthroat trout were placed back into the stream.

In addition, bull trout are listed as a 'Threatened' species under the Endangered Species Act. The Beaverhead-Deerlodge National Forest houses streams that are used by bull trout to spawn. However, that spawning activity can be disturbed by excess sediment eroding into these streams from roads, campsites and hiking trails. As part of a three-membered team, I, systematically documented potential erosion sites by traveling along USFS roads, mostly in the Anaconda-Pintler mountain range. We measured erosion depth, erosion length, presences and descriptions of buffers and vegetation to help determine best management practices for erosion sites. We worked together with crews from Phillipsburg, Montana to complete this project. More experienced members of the USFS used this data to implement prioritized management of the sediment erosion.

Finally, working with one of the forest biologists, I conducted aspen stand surveys to determine overall stand health. This work included looking for ungulate browse, regeneration, and aspen stand decadence.

The experience that I gained through this seasonal position allowed me to grow in my field data collection skills and learn how to effectively work with different entities to complete a project.

Candice Dunagan

The University of Montana Western
Environmental Sciences Department

I will be doing a presentation on Wildland Firefighting, as I worked for the Kalispell DNRC as a Wildland Firefighter. Fire is a natural event in forest ecosystems, many plant communities have adapted to and depend on wildland fires. There are many ecological benefits of wildland fire, they can reduce the amount of fuel build-up, remove alien plant species, and remove undergrowth to stimulate forest floor growth. Ash can add nutrients to the soil for upcoming trees and vegetation. The burnt trees provide habitat for birds and mammals. The White Bark Pine tree has been declining rapidly and there are four main reasons for this decline, the important one is altered fire regimes. This species relies on fire to kill the older generations with beetle infestations and clear area for a new population to be established. Around 90% of fires in the last decade have been human-caused, some by accident or negligence and some intentional arson. The remaining 10% are caused by lightning strikes. The benefits of fire are usually greater than the disadvantages. The intense heat from the fires can cause the soil particles to become hydrophobic making rainwater run off the soil rather than to infiltrate through it, this also contributes to erosion. The benefits of prescribed fire are immense, including reduced fire hazard, greater safety, cost efficiency, improved soil nutrients, and increased and diversified habitat for wildlife management. By conducting prescribed fires the communities within or around the area can be better protected from wildfires, this can help avoid wildfires burning under extreme conditions potentially causing loss of life, property, and resources. Overall, fire promotes biological diversity in ecosystems. This internship collaborates well with many of the classes I am taking. In conservation biology I attended the Nature Conservancy's plant conference and learned more about White bark Pine and how altered fire regimes are impacting the livelihood of the species. My future plans are to work with the DNRC or the Forest Service to manage and protect our landscapes, firefighting was my first step to this goal.

My Experience with the 2017 NIDA Summer Research Internship Program

Bobbi Irvin

University of Montana-Western
HPSS Department

My strong interest in addiction research led me to participate in the 2017 National Institute on Drug Abuse (NIDA) Summer Research Internship Program, which aims to increase diversity in research by placing competitive students from underrepresented backgrounds in a real research facility. I was placed within the HIV/AIDS Prevention Research Division at the University of Pennsylvania, an Ivy League university located in Philadelphia.

Over the course of the internship, I attended a variety of didactics related to drug addiction, staff meetings pertaining to the enrollment status of ongoing research projects, the screening and research procedures of research studies, community advisory board meetings, and seminars that discussed HIV/AIDS and opioid overdoses. I also completed trainings for administering naloxone to reverse an opioid overdose, Collaborative Institutional Training Initiative for ethics in research, administration of the Addiction Severity Index, Bloodborne Pathogens for safely handling blood, and HIPAA. Other tasks included transporting blood samples between labs, retrieving prescriptions for research participants, checking data for accuracy and completeness, and entering research data into an online database.

At the end of the internship, I conducted a secondary analysis on substance use before anal sex as a predictor of HIV risk or protective behaviors. To accomplish this task, I met with the principle investigator on a regular basis; received phone screen data from multiple studies; conducted literature searches; learned how to run data analyses on the software program SPSS; conducted a layered analysis to determine any potential differences within the results based on race; designed a presentation to discuss the background, results, and limitations of the study; and rehearsed the presentation with fellow interns and my research team. I then presented the final product to a community of researchers within the University of Pennsylvania.

By experiencing the functioning of a research facility, I learned the complications of research which led me to strongly consider pursuing a career in addiction research. I learned through visiting a new environment how to navigate and adapt to new situations. These experiences will be valuable for admittance into a graduate program and will help me to be successful in my chosen career.

Flood-irrigated habitat loss and its potential impact migratory waterbirds in the Big Hole Valley.

Dennara Gaub and Michelle Anderson

The University of Montana Western-Department of Ecology

Across much of the Western United States, agricultural production in river floodplains has traditionally utilized seasonal flood-irrigation techniques for crop and livestock management. It has recently been hypothesized that flood-irrigated habitats (FIH) mimic natural wetland features created by annual flood processes in ways recently implemented sprinkler irrigation systems do not. Despite the wide spread historical use flood-irrigation practices, only a handful of published studies have investigated the utilization of FIH by migratory and breeding birds in North America. The Big Hole Watershed provides a large study site that remains predominantly flood-irrigated within historic floodplain boundaries during the May – June period. Recently these landscapes have experienced large scale conversion from flood to pivot irrigation or non-agricultural land uses. This concerns wildlife biologists because flood-irrigated habitats (FIH) may provide important resources for fish and wildlife species, particularly during spring migration. Migratory water birds are an ideal study system to assess impacts of FIH loss. The loss of FIH raises several research questions: Does seasonal flood- irrigation provide preferred habitat for migratory water birds? Do FIH support occupancy of more diverse bird species and higher bird densities than non-FIH, and if so what environmental conditions allow this? Ultimately, what impact could the shift from flood-irrigated to non-flood irrigated have on migratory water bird populations in the Big Hole Watershed? The preliminary data collected during this past flood-irrigated season correlates strongly with the hypothesis of, flood irrigation providing preferred habitat to a variety of migratory water bird species in comparison to non-flood irrigated fields. This work is supported by Montana Institute on Ecosystems.

Small Animal Rehabilitation: Aqua Therapy, Exercise, Massage and Laser Treatment
Sarah Benjamin
The University of Montana Western
Biology Department

For my internship I spent last summer working at Canine Aqua Fitness and Veterinary Rehabilitation Center in Okotoks, Alberta, Canada. Veterinary rehabilitation therapy involves the use of specific non-invasive treatments, such as massage, exercise, laser treatments, hydrotherapy, tai chi, etc. to rehabilitate injured patients. While rehabilitative medicine is fairly new in the veterinary world, it is a rapidly expanding form of treatment. Canine Aqua fitness center is a small practice that has been open since 2013 and has a variety of patients from dogs and cats to birds and reptiles. Dr. Catherine Pampiglione, the owner and my internship mentor, has been practicing veterinary medicine and rehabilitation for over 15 years. For the 3 months I was there, I worked hand in hand with the staff to learn many of the basic skills required in rehabilitation medicine. I started with the basics such as cleaning and office work. Once that was mastered, I hit the books and learned the basics of rehabilitation therapy such as feline and canine anatomy, all the proper equipment required for all the different therapy sessions and proper medical terminology. I then worked with the rehabilitation technician and started participating in aqua therapy sessions and exercise. I also worked a lot with Dr. Catherine to experience the more in-depth treatments such as massage and laser treatments. She also let me help with consultation examinations which required reviewing patient files and performing several different exams on the animals. Once she felt I was ready, I got to prepare a treatment plan for a recovering patient and talk to the client about my treatment plan. Not only did I learn a lot about rehabilitation treatment options I also got to experience doctor/client communications. Overall, it was a very good learning experience for me and I know it will help me on my journey to becoming a veterinarian.

Comparing and Contrasting Two Orthodox Religions

Kayla Adair

University of Montana Western

Education Department

EDU 352 & EDU 311

For this symposium I am going to compare and contrast two different religions; they are, Orthodox Judaism and Orthodox Christianity. After spending all of block seven in Bellevue/Seattle, Washington, I have learned that all religions are similar, but they are also different. That is why I want to take a closer look into Orthodox Judaism and Orthodox Christianity. The reason is because, they are two of the oldest religions known to man and I want to know why they are similar, but so different. I would like to share my findings through a short presentation.

A Changed Perspective
Katie Bumgarner
Education
EDU 352

In Montana, students from a young age do not learn much about diversity. Many people from relatively small Montana cities tend to create prejudices or fears against certain races as a reaction to the news they see from larger cities. Although this response is logical, it is not necessarily the best response to implement. Instead of responding by what is told on the news, or what people say in conversations, it would be more practical to do research about these specific groups, or to reach out in the community to possibly find someone who can provide insight. Racism has been a problem in our country throughout history. I believe that educating people about different races is the most powerful tool that we implement to ensure understanding. Hopefully perspectives can be changed, as mine have during my recent field experience in Seattle, WA.

Students should not be denied an education because of their beliefs. Students should be taught to respect all ethnicities and diversities, because we are all Americans, regardless of our beliefs or skin color. Acceptance needs to be learned through research and hands on experience, because America is comprised of many diverse cultures and races, and it is not fair to deny any American their rights.

If accepted to speak at the symposium, I would like to introduce this topic utilizing a 10-15 minute oral presentation.

Cultural and ethnic diversity-based practices in international high schools (Chief Sealth Int'l High School).

Devyn Christian and Aubrey Carpenter

The University of Montana-Western

Education Dept.

EDU 352 and 311

In America today, it is crucial to remind ourselves about the importance of equity in each classroom. All over the United States, studies have shown a dramatic increase of more culturally and ethnically diverse students within our schools. It's obvious that no two students in a classroom are ever the same, but as educators, our goal to provide them with an equal opportunity for a SAFE, learning experience is our livelihood. In this context, we intend to share our experience while co-teaching at an international high school within the confines of metro Seattle. During our field-experience, we absorbed a great deal of culture that ultimately enhanced our understandings of our ethnically diverse and religious communities. At the symposium, we plan on giving an oral presentation lasting up to 10-15 minutes. Throughout this discussion, we intend to address the following ideas: praising individualism in each classroom, accommodating different religious ideals, and creating a supportive learning environment. This study is to encourage future teachers to use similar practices to become a more culturally inclusive educator.

Title: Counting Collections for Math in Preschool and Kindergarten Classrooms in the Seattle Public Schools.

Christina Hansen and Kyra Palmer

The University of Montana-Western

Education

EDU 352

We have been interning in the Seattle Public Schools at Dearborn Park International Elementary School in the Kindergarten and Preschool classrooms. Both classrooms use the Counting Collections system for counting with their students. Counting Collections is a system teachers use to count with their students and allows students to build better correspondence between items and numbers. Teachers give students a bag of objects that they count in English and Spanish. The teachers look for cardinality, estimating, one-to-one correspondence, and combining/separating. We are giving a presentation on how teachers can incorporate (based on what we have seen and experienced) Counting Collections in the small group setting.

Title: Compare and Contrast of the Different Religions in Our Classrooms

Name: **Lacey Knadler, Khali Knadler, and Halee Davis**

University of Montana-Western

Education Department

EDU 352/311

Abstract: Through research and field experiences, comparisons can be made of religions, such as, Islam, Buddhism, and Latter Day Saints. These three religions have many similarities and differences that make them independent and unique. The research experiences were conducted to introduce students to multicultural classrooms and religions that otherwise are not generally focused on in Montana. Through opportunities for exposure in Seattle, Washington, we learned about each of the religions through presentations and tours of the facilities, but chose to learn more about one of the three religions listed above. We would like to share our action research through a short presentation.

Religious Diversity in Seattle
Megan Lombardi
Education Department
EDU 352 & 311

In the greater Seattle area 38.67 percent of people have an affiliation with a religion. This percentage was taken from twelve different religions that are observed in the area. As a teacher, I will see these different types of religions in my classroom. During my time in Seattle I had the opportunity to visit five of the different types of religions that are practiced. During, my oral presentation I will talk about these different types of religions that we have visited. I will discuss how they are similar and how they are different from each other. I will discuss how they are transferred into my classroom and how I can offer the best support for these students in my classroom. I will briefly talk about the other types of religion in the area that I did not have the opportunity to visit.

Why do people do bad things to others?

Edson Mendoza

Elementary Education Department

EDU 352 & EDU 311

“Why do people do bad things to others?” This is how our Philosophy class began during my field experience with the fifth graders of Thurgood Marshall Elementary School. The students discussed different reasons to answer this question, one that stuck with me was ignorance. As I familiarized myself with the different cultural backgrounds in the city of Seattle, I became aware that nearly everything I knew about these people was wrong. It became clear to me that ignorance is the primary reason for people choosing to cause harm to others. From a young age we are made to believe that people are either inferior or superior to others. We are taught to believe that some people, based on their religious background are wicked people and will cause us harm. We live in a society where people that are born in different cultures are immediately labeled as criminals, indolent, or terrorists. There is an unnatural amount of violence and conflict that erupts from these misconceptions and stereotypes. For my symposium I would like to do a 10-15-minute oral presentation on cultural and racial ignorance, and ways we as teachers, can solve this problem by using educational means.

Jason Bowman

The University of Montana-Western
History, Philosophy, and Social Sciences Dept.

The period of time in Northern Ireland between 1966 and 1996, known to many as The Troubles, has yet to cease in providing the foundation for a number of questions crucial to both history and politics. Among these is the question of what drives a people – in this case Roman Catholics – to voice their displeasure through violent means? In order to answer this question, the events of Northern Ireland from 1966 to 1972 are viewed through the lens of contentious politics but focused more specifically on the repertoires of claims-making performances used by Roman Catholics, the relative capacity and democracy of the Stormont regime, and the political opportunity structure within which Roman Catholics found themselves. In short, Roman Catholics through the Northern Ireland Civil Rights Association, the Citizens' Action Committee, and People's Democracy utilized public demonstrations – most notably marches – to pursue their formal demands – that of 'one man, one vote,' ending of housing and employment discrimination, ending of gerrymandering, machinery to deal with complaints against public authorities, the end to the Special Powers Act, and the dismantling of the vicious B-Specials – but were met with severe repression and open violence, effectively a closing of the preexisting local political opportunity structure while simultaneously embracing the wave of political violence emerging on the late 60s international scene, leaving violence as the alternative. Among a range of secondary sources, the works of Tim Pat Coogan, J. Bowyer Bell, Charles Tilly, and Sidney Tarrow were crucial to reaching this conclusion.

The Architecture of the Afterlife: Constructing the Ethereal Realms of *The Divine Comedy*

George Lewis (Luke)

The University of Montana-Western

Department of History, Philosophy, and Social Sciences

In his magnum opus *The Divine Comedy*, poet Dante Alighieri constructed his unique conception of the realms of Paradise, Purgatory, and Hell. In studying the historical antecedents that inspired this poem, I found that the construction of each of these realms was defined by a unique subject important to Alighieri's everyday life. When examined, this work shows the profusion of science, theology, philosophy, and politics that permeated the intellectual life of Dante's day. In careful research of the poem and the world in which it was composed, I found that Dante's *Inferno* was inspired by Greek and Roman philosophical models, his *Purgatory* by the Catholic dogma of the time, and his *Paradise* by the scientific models widely accepted as the Medieval era gave way to the Renaissance. When viewed as a whole, the separate Canticles of *The Divine Comedy* show what Dante Alighieri thought about the major intellectual pursuits of his day, and how he used them to construct the physical spaces found in his poem.

A Novel Approach to Utilizing Spectroscopy for the Early Detection of *Borrelia burgdorferi* Transformants Plated Using Limiting Dilution.

Courtney Anderson and Dr. Michael Gilbert

University of Montana Western

Department of Biology

Borrelia burgdorferi, the causative agent of Lyme disease, can be cultured in vitro by utilizing Barbour, Stoenner, Kelly (BSK-H) Complete Media. This is a complex liquid growth medium and detection of cell development is facilitated by the use of a pH indicator known as phenol red (phenolsulphonphthalein). As cell growth occurs, lactic acid is produced as a by-product of fermentation which causes a shift in pH of the media from 7.6 to 6.8 (red to yellow). The standard method for detection consists of holding plates against a white light source and attempting to visually detect a color change. Due to the slow doubling time of *B. burgdorferi* (8-24 hours) and the limits of the human eye, this process is extremely inefficient and typically results can be visualized between 10-21 days. Phenol red has a maximum absorbance of 558 nm when unprotonated and 432 nm when protonated, therefore; it seems logical that a microplate reader could be utilized for earlier detection of cell growth. For the purposes of this study, 200µg/ml of kanamycin, 50µg/ml of streptomycin and 40µg/ml of gentamycin were added to 10 ml of BSK and *B. burgdorferi* cells (strain A3-LS-OPK) were added. 200µl aliquots were plated and examined daily at 432 nm and 558 nm wavelengths using a Spectra Max Plus 384 microplate reader and these readings were then analyzed for correlations with Soft Max Pro 5.2 software. To the best of our knowledge, no other research is currently being performed in this area, and if successful, this would be a novel approach to early detection of *B. burgdorferi* transformants.

Limits of acceptable change for backcountry campsites in the Bob Marshall Wilderness Complex

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During the summer of 2017 I was a Wilderness Ranger Intern for the Bob Marshall Wilderness Foundation in conjunction with the Forest Service. I worked throughout the Great Bear and Bob Marshall Wildernesses, located in the Flathead National Forest. My internship entailed hiking to remote campsites and recording information about them on a Limit of Acceptable Change (LAC) form. This included total area, vegetation cover, mineral soil exposure, tree damage and root exposure, number of fire scars, number of trails, and barren core camp area. Each category has a point rating system that was used to calculate an impact rating number. This helps the Forest Service know which areas are receiving the most use and where they should invest resources. The Wilderness is divided into Opportunity Classes (OC), with OC 1 being the least used areas and OC 4 being the most used areas. OC 4 tends to be along rivers, near lakes, and around well-known peaks. OC 1 makes up most of the Wilderness, with vast stretches of untrammeled landscape. These Opportunity Classes can change over time as new LAC information becomes available. Most of the campsites were within a day's hike of Schafer Ranger Station, where I was stationed. On occasion I was able to stay in Forest Service cabins, especially when working near the popular Continental Divide Trail. Many hikes in remote locations required backpacking for several days at a time. The completed LAC forms were sent to Spotted Bear Ranger Station every other week via pack mule. The data showed that overall campsite use in the Wilderness has gone down over the last decade. Famous locations such as lakes and peaks have maintained their notoriety, but visitation in the secluded areas has plummeted. However, traffic along the Middle Fork of the Flathead River has increased as pack rafting has become more popular. This information will be helpful to the Forest Service in the future for planning and budget management.

COINTELPRO: The Other Side of the 60's

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The era known as the sixties was a decisive time for America, and there may be no better example of this than the Federal Bureau of Investigation's Counter Intelligence Program. A program that was created with the intension of limiting a foreign government's operations within the borders of the United States was turned into a program that aimed to limit the words and actions of disenfranchised American citizens. What was COINTELPRO, and what were the motivations that led to the program's expansion into Black Extremism and White Hate? Who was the man who oversaw the creation and execution of the program? How could the same program that was responsible for the deaths of leaders in the African American communities also be responsible for dismantling and driving various White Hate groups underground by the early 70's? The presentation of this paper will focus on the Federal Bureau of Investigation's Counter Intelligence Program and its effect on society.

Highlights of a Fisheries and Information Intern with Montana Fish, Wildlife, and Parks.

Bowden Colt Godfrey

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During the summer of 2017, I worked with the Montana Department of Fish, Wildlife, and Parks (FWP) as a Fisheries and Information Intern. For this internship, approximately half of the summer was spent working with a fisheries management crew on the Missouri River below Fort Peck Reservoir in eastern Montana where we conducted various long-term monitoring surveys on the critically endangered pallid sturgeon and other species. This part of my internship required me to take on the role of a fisheries technician and become proficient in the deployment and use of several capture gears such as trammel nets, trotlines, beam trawls, seines, and larval drift nets. These studies were conducted to monitor behavior and life history of mature pallid sturgeon, determine genetic composition of both adult and immature sturgeon, harvest milt and eggs from mature sturgeon for future propagation efforts, and to determine the composition and health of fish communities in this reach of the Missouri River. The second half of this internship was spent working with a regional information and outreach director for FWP in Glasgow, Montana. As an information intern, I was responsible for aiding the director in organizing and conducting various public outreach events related to fishing, hunting, and natural resources. Some of these events included: fish dissections and wildlife demonstrations with local elementary and middle school classes, kid's fishing derbies, and kid's fishing days for the "Hooked on Fishing, Not Drugs" program.

A Machiavellian Analysis of Nationalism, Trump, and the 2016 GOP Primary

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The 2016 U.S. Presidential election cycle saw Donald Trump take a nationalistic platform and rhetoric that propelled him to become the nominee of the Republican Party. There are an innumerable number of factors that played a part in Trump's nomination; yet, how Mr. Trump used nationalism played more than just a nominal role in the campaign. With an eye towards the traditional base of the Republican Party the campaign was able to sow fear of "otherness" in present-day American society clothed in the defense so-called "traditional American culture." With campaign slogan "Make America Great Again" Trump was able to co-opt the imagined community of the Republican Party. This was accomplished by implying that the policies of just not the opposing party, but also the leadership of the GOP made America fundamentally lesser than the state of the nation in previous generation. With the use of fear viewed in terms of Machiavellian theory, one can start to understand how the Trump campaign influenced their voters so effectively during the election cycle. This thesis will explore theories of nationalism and its historic effects in America to understand why such forces still resonate so profoundly in the consciousness of the citizenry. The thesis will also show that Machiavelli's theories on political reality are as profoundly relevant today as when first conceived during the Renaissance.

Super Edge-Magic Labeling of Trees

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There is a branch of mathematics called graph theory. Graphs in graph theory do not deal with x and y axes; these contain vertices and edges. Trees are a specific type of graph: they are connected and have no cycles. The concept of trees in biology applies to trees in graph theory in which they branch out and do not create cycles or loops. If a tree contains n vertices, then it will always contain $n-1$ edges. This work is concerned with the conjecture that every tree has a super edge magic labeling. A super edge-magic labeling is defined as follows: If one were to label the tree's vertices 1 through n and also label the tree's edges 1 through $n-1$, every single segment of that tree would add up to the same number. I created a brute force program using MATLAB that creates a specific type of graph, and then goes through a process of finding a super edge magic labeling for the graph created. Solutions are found for many trees, and the probability of the program finding a solution was estimated. I also proved the exact probability for specific types of trees.

Montana FWP Region 4 Wildlife Intern for the summer of 2017

Shelby Smith

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I spent the summer of 2017 working as an intern for Montana Fish, Wildlife and Parks in Region 4, out of the Great Falls office. My work was mainly split between the Non-game Biologist doing surveys and studies on birds, bats, and lizards, and her husband who is the Wolf Specialist for the region. I was also able to spend time working with the Fisheries Dept. and the nearby Giant Springs Trout Hatchery. Furthermore, I spent a short amount of time assisting some technicians out of Region 2 (Bitterroot Valley) with some surveys on salamanders and birds, as well as grading waterfalls. I chose to apply for this internship because of its relevance to my desired career field, its exposure to both field and office work as the relate to wildlife biology, and because it was located in the largest region that FWP manages so the projects would be the most diverse compared to the smaller regions. The many experiences I had last summer were invaluable in showing me what meant the most to me in terms of my own career path. I realized that I was more drawn to the studies with an ecological basis, especially when it related to constructing a conservation plan. For this reason, I eventually switched to UM-Western's new Ecology degree, with a focus on Fish and Wildlife Ecology. I hope to use what I learned during my internship to secure a position at the state or federal level as an Ecologist, hopefully either conducting behavior research or performing conservation work. I would also love to work for a rehabilitation/rescue facility such as a zoo or an aquarium in the future.

Larry Snellings Jr.
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History

The Cowboy of the Old West

There has been written about the American cowboy, and much about him has been misunderstood. What did the cowboy do? Who was he? How did he do his job? And what was his part in the development of the American West? Throughout the Twentieth Century movies, novels, myths, and legends have created a picture of the cowboy of the Old West in a manner much different than he actually was. The job of a cowboy was not a romantic one, it was difficult, often dangerous, tiresome, and yet rewarding. The way their job needed to be done demanded long hours in the saddle, difficult horses, large herds of paranoid cows, and months out on the range. To arrive at an answer to these questions, primary sources, such as memoirs, newspapers, and journals have been used to form the basis of this research project. Furthermore, a secondary source written by a former cowboy of the Old West, titled *The Cowboy*, provides the history of the cowboy from a more scholarly perspective. It is thus the purpose of this project to present an accurate picture of the cowboy of the Old West and his importance in the development of the Frontier.

My Internship at Barrett Hospital and Healthcare Laboratory and Pharmacy

Chloe Worl

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This Spring I completed my internship at Barrett Hospital and Healthcare (BHH) in Dillon, MT. Barrett Hospital and Healthcare has been serving the Dillon community since 1922. A new hospital was recently built in 2012 that now holds 18 beds. I was fortunate to be able to shadow in two departments of the hospital, the Laboratory and the Pharmacy. I find microbiology and medicine extremely interesting, so this internship was a good opportunity to get experience in those areas and it was extremely helpful to me in deciding a career in healthcare. During the Laboratory portion of my internship I shadowed several different Lab Techs throughout the day. In a rural hospital, it is common for a lab tech to work in any area of the lab. The BHH lab is divided into several areas consisting of chemistry, blood bank, microbiology, hematology, urinalysis, pathology, coagulation, and phlebotomy. The amount of experience I gained through shadowing at the lab has encouraged me to further my education and get certified as a lab tech. For the Pharmacy portion of my internship I shadowed two different pharmacists and two different pharmacy techs. I shadowed the pharmacists in both the hospital and the clinic and learned about the differences between acute patients in the hospital and chronic patients in the clinic. While shadowing the pharmacy tech I was able to get hands on experience assisting the pharmacist and I learned more about the interactions between pharmacists, patients and healthcare providers. Overall, this was an amazing internship and it opened up doors for me. I now get to return to BHH as an employee in the Lab working as a phlebotomist.

Falon Wofford

University of Montana Western
History Department

The focus of this thesis is on the women homesteaders and how their experience differed from a man on the frontier. In this day and age, it is extremely important to highlight the women of history and how they were able to overcome extreme hardships during their time on the homestead. I researched the laws and regulations of the Homestead Act of 1863 to give my thesis a deeper stance. To understand the gravity of what it took for a person to homestead it is important to know how homesteading came to be in America.

Women found that homesteading was more challenging due to the restrictive regulations placed on them during this time. Unlike men, women had higher stipulations to meet before they were able to gain a homestead to call her own. Multiple accounts of women on the frontier have been examined in my research and I have included many firsthand accounts in my thesis. Why were women motivated to take up a homestead all on their own? Did her motivations to go it alone change the experiences she would have had if she had been married? How were the experiences of the women different from solo men on the homestead? These are the questions that I will be answering today.

Claiming land in the west sounded ideal to many single women who hoped for a way to provide for herself or her family. This thesis attempts to address misconceptions and answer questions relevant to explaining the important contributions made by the women brave enough to take on the task of Homesteading.