THE WYOMING Archaeologist

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THE WYOMING **Archaeologist**

WYOMING ARCHAEOLOGICAL SOCIETY, INC.

THE WYOMING ARCHAEOLOGIST is published semi-annually by the Wyoming Archaeological Society, Inc. Address manuscripts and news items for publication to: Dr Danny Walker, Editor, The Wyoming Archaeologist, 1687 Coughlin St, Laramie WY 82072.

INFORMATION FOR CONTRIBUTORS

The Wyoming Archaeologist accepts papers from professional archaeologists, students, and avocational archaeologists. Subjects published in The Wyoming Archaeologist include, but are not limited to, archaeological reports on sites in Wyoming and adjacent areas, descriptive project summaries, preliminary results of significant studies, archaeological method and theory, ethnographic studies, regional history, and book reviews. Submissions by professional archaeologists will be sent for peer review before acceptance.

Authors submitting manuscripts for consideration should follow the style guidelines of the journal *AMERICAN ANTIQUITY* as revised in June 2017 and updated in July 2018. These guidelines can be found at www.SAA.org. Complete instructions for authors were published in *THE WYOMING ARCHAEOLOGIST*, Volume 62(1), 2018, and can also be found on the inside back cover of this issue. Deadline for submission of copy for spring issues is January 1 and for fall issues is July 1. Reports and articles received by the Editor after those dates will be held for a following issue.

The society membership period is from January 1 through December 31. All subscriptions expire with the Fall issue and renewals are due January 1 of each year. Continuing members whose dues are not paid by March 31 of the new year will receive back issues only upon payment of $5.00 per issue. If you have a change of address, please notify the Executive Secretary/Treasurer. Your *WYOMING ARCHAEOLOGIST* will not be forwarded unless payment is received for return and forwarding postage. Back issues in print can be purchased for $5.00 each, plus postage. Back issues out of print are available at $0.25 per page plus postage.

Checks for chapter subscriptions and renewals should be sent to the chapter secretary involved. All other checks, subscriptions, and renewals should be addressed to the Executive Secretary/Treasurer. Correspondence and orders for back issues should be addressed to the Executive Secretary/Treasurer.

A list of chapters and their officers can be found at: http://www.wyomingarchaeology.org/was-chapters.html

Society yearly subscription rates are as follows:
Individual Associate Member - $20.00
Institutional Member - $30.00
Canada and Other Foreign - $34.00

Other memberships may be available. Contact the Executive Secretary/Treasurer for information. Local chapter dues are in addition to state society dues. The Wyoming Archaeological Society is a Nonprofit Organization.

The Wyoming Archaeological Society, Inc. and its local chapters do not discriminate on the basis of age, gender, sexual orientation, gender identity, gender expression, ethnicity, disability, national origin, political affiliation, or religious belief.

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On the Cover:
Wyoming RS/RG Points, Variant A (a-d), Variant B (e-h), Variant C (i-l),. Eckles, this issue.

THE WYOMING ARCHAEOLOGIST
VOLUME 65(1), SPRING 2021

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WYOMING CULTURAL TRUST FUND
BECAUSE OUR CULTURE MATTERS

"Publication of this issue of The Wyoming Archaeologist is supported in part by a grant from the Wyoming Cultural-Trust Fund, a program of the Department of State Parks and Cultural Resources."

THIS ISSUE PUBLISHED DECEMBER 2022

WYOMING ARCHAEOLOGICAL SOCIETY MEMORIAL GIFT or CONTRIBUTION FORM

Given by: *Miss, Mrs., Mr., Ms., Dr.* $ _____ *(Amount)*

Name: *Last* _____ *First* _____ *Middle* _____

Address: _____ *City & State* _____ *Zip* _____

Donor phone number *( )* _____

TYPE OF GIFT: ***General Contribution*** *[ ]* ***Specific Contribution*** *[ ]*

In Memory of: _____
Name *City & State*

In Honor of: _____
Name *City & State*

Specify where you would like your money to go (e.g., Mulloy or Frison Scholarship Funds, The Wyoming Archaeologist, ???????)

Please make your check payable to THE WYOMING ARCHAEOLOGICAL SOCIETY
Send to Carolyn Buff, Executive Secretary/Treasurer, 1617 Westridge Terrace, Casper, WY 82604

WYOMING ARCHAEOLOGICAL FOUNDATION MEMORIAL GIFT or CONTRIBUTION FORM

Given By: Miss, Mrs., Mr., Ms., Dr. ***$***_____
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NAME: ***LAST*** ***FIRST*** ***MIDDLE***

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ADDRESS: ***CITY & STATE*** ***ZIP***
Donor phone number: _____
Type of Gift: ***General Contribution [ ]*** ***Specific Contribution [ ]***
In Memory of: _____
Name ***City & State***
In Honor of: _____
Name ***City & State***
Please specify where your donation is to be placed.
Jensen/Robson Research Grant _____; Jensen/Robson PhD Travel Award _____;
Hell Gap Research _____; WAF General Operations ____; Other _____.

Please make your check payable to the WYOMING ARCHAEOLOGICAL FOUNDATION and mail to Marsha Peterson, WAF Treasurer, P.O. Box 2168, Laramie, WY, 82073; 307-766-5564.

Any funding for the George C. Frison Institute please contact Dr. Jason Toohey at University of Wyoming Anthropology, Dept. 3431, 1000 E. University Avenue, Laramie, WY 82071; or email jtoohey2@uwyo.edu.

NEWS AND INFORMATION

Wyoming Archaeological Society, Inc.
2022 Annual Meeting Minutes
8:12 am, Sibley/Diamond Rooms, Ramada Plaza by Wyndham Sheridan Hotel & Convention Center, Sheridan, WY
Saturday, April 30, 2022

Presiding: John Laughlin, President
Call to Order: 8:12 am.

Report of Credentials Committee/Roll Call of Delegates:

Mavis Greer, acting on behalf of the Executive Secretary/Treasurer Carolyn Buff (who was unable to attend the meeting due to health issues) certified the voting delegates:

Absaroka: Wes Huber and Mike Bies
Ancient Trails: Cher Burgess and Alice Tratebas
Casper: John Greer and Mavis Greer
Cheyenne: Dan Bach and Richard Currit
Fremont: Kathy Kowalik and Ed McAuslan
June Frison: Carmen Clayton and Charles Koenig
Pumpkin Buttes: Robin Carlson and Leroy Dike
Sheridan/Johnson: Jenny Aiello and Christine Varah
Upper Green River Basin: Dave Vlcek

Roll call showed nine chapters represented as listed above.

Approval of Zoom Business Meeting Minutes of May 1, 2021:

Motion by Robin Carlson, second by Christine Varah, to approve the minutes as published in Volume 63(1) Spring 2019, printed March 2022, issue of *The Wyoming Archaeologist*. Carried.

Treasurer's Report:

Copies of the Treasurer's Report prepared by Executive Secretary/Treasurer Carolyn Buff were distributed to the voting delegates. It shows a total net worth of $82,135.45, a gain of $6858.69. There was no discussion of the report.

Auditor's Report:

Robin Carlson, Sylvia Huber, and Mavis Greer comprised the audit committee. Robin reported the committee approved the Treasurer's Report with the one-cent typographical correction as being consistent with previous practices.

Editor's Report:

John Laughlin presented this report on behalf of Danny Walker, who was not present due to health issues.

One issue was just printed and sent to the membership. Three more issues are ready to print. In the fall 2021, Danny, John, and Carolyn wrote a Wyoming Cultural Trust Fund grant for $6000, which will be matched by WAS, and it was awarded to catch up the publications. We have 18 months to use it to catch up the back issues of *The Wyoming Archaeologist*, which will be accomplished by the end of the year.

Discussion on the report:

Cher Burgess: Do we have enough articles to fill those issues?

John Laughlin: Yes, plus enough articles for a couple more issues beyond that, but still continue to send in articles.

Chase Mahan: Is Danny still the point of contact for the journal?

John Laughlin: Yes. His contact information is on the web site on *The Wyoming Archaeologist* page and on the inside front cover of every issue.

Librarian's Report:

Chase Mahan, WAS Librarian, reported the library is in good order and is being cleaned. Please contact him with anything regarding the library.

There was no discussion.

Committee Reports:

1. **Scholarship:** Spencer Pelton reported that we had 16 applications this year. A Google Form was developed to poll the committee's opinions for the recipients. The results will be finalized by the committee during the upcoming lunch meeting and results presented at the banquet tonight.
   Discussion: Rachael Shimek commented that two book selling fundraisers to benefit the scholarship funds are being held at this meeting.
2. **Chapter Reports:** Send them to Carolyn for printing in a future journal.
3. **State Archaeologist's Report:** Spencer Pelton reported the state legislature has approved the hiring of a biological anthropologist for their office to deal with human remains found in the state on private and state lands. The position

funding will come in equal amounts from the State Archaeologist's Office and the Department of Anthropology in Laramie. That person will teach in the department also.

Large projects going on right now include cataloguing and cleaning remains from the Vore site from 1971 to 2000, which is funded by a grant from the National Park Service in partnership with the Institute of the Museum and Library Services, the National Endowment for the Arts, and the National Endowment for the Humanities. This results in curation grade packaging and an inventory. At the end, there will be a web site hosted by UW Library that will be accessible to the public that will have three-dimensional models of all the skulls from the Vore site and all of the primary paperwork and slides from the excavations and a database. Part of the project is to collaborate with a geneticist on dog remains from the site and their evolution associated with wolves.

OWSA will be working south of Laramie at the Willow Springs site June 13-26, 2022, and still needs volunteers. Contact Spencer if you would like to participate.

Discussion:

Cher Burgess thanked them for updating people on Facebook. Spencer commented that the Vore Foundation is doing that and is working in cooperation with OWSA.

Marcel Kornfeld commented that Spencer was following up at Willow Springs 60 years after Mulloy, and Marcel was happy to see the artifacts being processed and leaving his lab, which have been there since Mulloy left them there.

4. **SAA/COAS:** Marcel Kornfeld reported that at the 2019 meeting, he begged people to take over his position, but he got no takers. This year at SAA, he stopped by the COAS table and noticed they had some WAS brochures there, but he was not sure how up-to-date they are. Also, COAS now stands for Council of Allied Societies, instead of Affiliated Societies. He picked up some brochures and stickers on COAS, which he has available, and copies of the latest newsletters, which are meant to be accessed online.

OLD BUSINESS.

Web Site/Social Media/Listserv:

John Laughlin reported that he and Dan Bach continue to maintain the web site, and they have been in contact with all the chapters. They have updated officers and posted any speakers lined up.

The Society and some chapters now have Facebook pages.

Listserv is the same Google Groups. John encouraged all the Chapters to get all their members on the Listserv by sending John a list of email addresses that need to be added

The web site will expire in 12/2024, and he hopes to move us to a new platform where we can have a storefront and electronic payments through one system. It will make it easier for Chapters to transfer money every year in March to the state. Chapters are supposed to pay their dues by March 31, and most have paid on time and others are paying today.

Archaeological Awareness Month:

Judy Wolf requested $250 for 2022 Archaeology Awareness Month to help pay for the poster and archaeology fair. The motion to donate $250 to Wyoming Archaeology Awareness Month was made by Christine Varah, second by Jenny Aiello. Carried.

Discussion: Dave Vlcek thanked Judy for the new poster, which is nothing less than spectacular.

State Historic Preservation Office:

Brian Beadles reported there are currently two open positions, those vacated by Judy Wolf and Shane McCreary.

They are currently working on a historic context on irrigation resources, which is in draft form and being reviewed and soon to be finalized, and another on African American resources in the state, which should be done sometime next year.

National Register activities are happening mainly in the Sheridan area. There are two nominations for homesteads in Sheridan County. The Sheridan CLG has a grant to nominate a church in Sheridan, and the contractor that worked on the African American context is looking at a house in Sheridan to nominate to the Register. The next National Register Review Board will be meeting in June in Sheridan.

The Archaeology Fair will be held in Laramie at the Territorial Prison on September 10.

Two Programmatic Agreements are currently being developed. One deals with a wind farm southeast of Laramie (the Rail Tie project), and it is almost done. The second is the GBSD (Ground Based Strategic Deterrent), which is a new nuclear system that involves six states and revolves around Warren AF Base. It is complicated because it involves so many states and tribes.

Wyoming History Day:

Rachael Shimek reported that the WAS and WAPA

awards were combined for a Wyoming Archaeology prize of $200 was awarded to middle student from Powell named Ally Morrow, who did a project on a display about Babylon. She felt it was good to combine the money.

Discussion: The next Wyoming History Day will be next spring. The WAS/WAPA awards are made at the state level of competition. Wyoming History Day is sponsored by the American Heritage Center, and they are always looking for judges. Rachael will put out some information about the event and a call for volunteers.

Dave Vlcek: he has been a judge for a long time, and he asked the award winner was going to nationals.

Rachael: no, she did not qualify for nationals.

John Laughlin: highly recommend you get involved in Wyoming History Day. He has been a judge for 10 years or so.

Frison Institute:

Todd Surovell reported there will be a ceremony this coming Friday, May 6, to officially rename the Anthropology building the George C. Frison Building. Everyone is invited.

The fall speaker has yet to be been decided, but it will likely be Kara Cooney, an Egyptologist from UCLA, on Wednesday, September 22. If not Kara, it will be Barbara Mills from the University of Arizona.

The state of the Frison Institute Endowment is good. We have about $955,000 thanks to many, many donations from generous donors, several in this room. That money goes to support Wyoming archaeology.

Wyoming Archaeological Foundation:

Mavis Greer reported that the Foundation last met in July 2021 at Hell Gap. We dealt with several issues. The main items were updating the bylaws and re-signing of the Hell Gap agreement with Marcel Kornfeld and Mary Lou Larson. All is well with the foundation, and we will be meeting again this afternoon. If you have any questions, please let us know before that meeting.

Wyoming State Parks:

Dan Bach reported that they continue their campground expansion. Recognized RVing USA for all the hard work they have done to make sure that it happened.

Dan then recognized John Laughlin's work for the WAS on behalf of the WAS and presented him with certificate of appreciation. He not only took on the day-to-day activities but also for securing the Zoom account and writing and receiving the grant money to publish *The Wyoming Archaeologist*.

Wyoming Office of the State Archeologist, Survey Section:

Michael Page was not present so Spencer Pelton reported they are working on some WYDOT projects, as usual, and they are surveying the Red Mountain area southwest of Laramie, which damaged by fire, with some BLM fuels reduction money. Michael is working hard on a handbook of high plains ceramics based on his years of research.

John Laughlin added that he spent some time at Medicine Lodge Creek last summer with Michael and his crew. They did some excavation and interacted with the public every day. Carolyn Buff, Robin Carlson, and Leroy Dike were also there.

NEW BUSINESS.

The Wyoming Archaeologist funding and digitizing.

Spencer Pelton gave a quick summary of the proposal to digitize the journal and get it placed online through tDAR and move the new journals to a digital format for distribution. In order to get the back issues ready for uploading to tDAR, it will be necessary to hire a person to format the old issues. This person will be hired with the funds saved by not printing so many copies of the journal and by grant monies raised. This proposal is also asking the membership to opt out of print copies and accept digital copies instead. However, those who do still want a paper copy will get it at no extra charge. Those who get the digital version will see it in full-color. If this is approved, an editorial board will be formed to assist with bringing the journal to completion without it falling on the shoulders of only a couple of people. This option would start in January 2023. This information had been presented to the Chapters in detailed written form by Spencer and his committee over the past couple of months.

A motion was made by Carmen Clayton and seconded by Jenny Aiello to:

1. Give permission to move forward with fundraising to digitize *The Wyoming Archaeologist*,
2. As of January, 2023 membership renewals, the membership must opt in if they want to receive print copies of *The Wyoming Archaeologist* or they will only receive a digital copy, and
3. permission to establish a five-person Editorial Board.

Discussion:

Mike Bies: on the Zoom call, we discussed formalizing the assistant editor to the Assistant State Archaeologist. That will require a revision of the bylaws, so in the motion I think we should look at including formalizing the Assistant State Archaeolo-

gist in that position.

Spencer: I discussed with Marcia about her willingness to do that, and the reason we did not bring that up is we need a 60-day prior notice for a by-laws change, but we could include something about that happening.

Mike: That's fine, but I want to make sure it is considered.

Mavis: Mike, do we have to include it in the bylaws? I think that rather than make that a part of the bylaws that should be more part of the regulations of the Editorial Board. The State Archaeologist and Assistant State Archaeologist are an integral part of the organization anyway, and I don't think we should include that in the bylaws. If it is in the regulations rather than the bylaws it is possible to make changes if the people in those positions cannot work with others on the Editorial Board things will not be stalled.

Dave Vlcek: Who pays for the student to do the digitizing?

Spencer: The intent is to pay for that position out of cost savings from not printing so many journals. If those funds do not add up, we will figure that out later.

Dave Vlcek: I don't have a rider on this horse. It looks like the management of *The Wyoming Archaeologist* will be turned over to the Anthropology Department of the University of Wyoming, not WAS. I don't have a rider on this horse.

Rachael: I know, but I'm not sure where you're getting that from. The intent is to have a full board of people from wherever.

Dave V: Well, the University of Wyoming, Department of Anthropology person, a graduate student, and etc. I don't have a rider on this horse, but I want it to be understood.

Sarah: Dave, I think you might have a rider on the horse.

Dave V: No, I don't.

John L.: I'm not understanding what the problem is with tying this in with the Department of Anthropology.

Dave V: I'm just pointing out that this will then become the property of the department.

John L: No, this does not become the journal for the department. This is the Wyoming Archaeological Society's journal, and it always will be.

Dave V: I'm entitled to my opinion, and I stand by it.

John L: Yes, you are entitled to your opinion, Dave. Yes, you are.

Dave V: That's it.

John Greer: I just want to reiterate what Carolyn's proxy said, and I think Mike has a good point. However, whoever is the assistant editor can be handled internally with the Editorial Board working together to determine who is going to be the editorial assistant or whatever title they have. That should be able to rotate between people or have as many people as they want.

John L: Any more discussion?

Cher Burgess: I understand there will be a five-person Editorial Board, and there is nothing to prevent members at large from being part of that Board, so I don't think the Society will stand to lose anything because they are going to be part of who's on that Board too.

John L: There will probably be more involvement from the Society in the journal than there has been previously.

Cher B: Yes, I mean at this point it's Danny's responsibility and Danny's baby, and I think that this proposal will be good for us not only taking all the responsibility off one person but will also allowing more involvement with the journal process by anyone in the membership.

Mike B: I think it's important that this Editorial Board (or whatever we're calling it) include someone who's got a good command of the English language as written. Carolyn has a really strong background in English literature, and she served (I don't know if formally) as assistant editor or if she just functioned as it. I think it's important not just have some graduate student because frankly most of them don't understand written English.

Rachael: Carolyn has a lot on her plate, and I'll bet she would be honored if we asked her, but I also think she has a lot going on and she does so much for the organization. The idea is to spread the work around a bit.

Mike B: I wasn't suggesting to keep her on for the rest of her life. I was simply making sure that there is that thread of continuity that someone with a formal English education is involved.

Marcia Peterson: I don't know if this will put your mind at ease at all, but I was an editor of the *Wyoming Law Review* when I was in law school. So I have served as a peer review journal editor in the past and feel pretty confident that I can review the grammatical rules and the format of these articles. As long as you guys turn in some cool content we can…

Mike B: so are you going to commit for life, then?

Marcia: probably! I'll probably die in my chair.

[People talking over each other.]

Mary Hopkins: I just want to say that this is the best plan I've heard of for *The Wyoming Archaeolo-*

gist for all the years we've struggled with how to make sure it was kept up-to-date and that papers were submitted. It is great to have a review panel. It really is the best solution I've heard, and I am totally in favor of it.

John L: Thank you, Mary. I really appreciate that comment. You know we've put a lot of time and thought put into this, with Danny, with Carolyn. Everybody has been involved in this process. None of it was done in the back room.

Christine Varah: I have two questions. All of our Chapter reports will then be posted online with the journal and how will the student position be advertised?

John L: Yes, they will be posted. We haven't gotten that far regarding how they will be advertised, right?

Spencer: Yes.

Christine V: It has been difficult to talk about *The Wyoming Archaeologist* to our members because it is behind.

John G: I want to support Mike on his comment that we need some one who knows English grammar on the Board, but I don't think we need to name that person. That should be up to the Editorial Board to decide who they want either within or outside the group.

Marcel Kornfeld: I agree with Mary that this is the greatest choice for *The Wyoming Archaeologist*, but being the editor without an Editorial Board means that no one gets in your way. What is the Editorial Board going to do?

Spencer: Assist the editor. Assist in solicitation of articles, send things out for peer review, etc. Help the editor with the big task of compiling the journal.

Marcel: Okay, that's important to get people on the Board who are willing to do that.

Cher: called for the Question.

Voted on Motion: All in favor except Dave Vlcek, who voted against. Will articulate his dissent in the form of an email to the Board. Motion carried.

Create a third signatory on WAS financial accounts.

Health issues have shown the organization that it is prudent to have another person eligible to sign on state level WAS accounts. Motion by Wes Huber, second by Robin Carlson to appoint Spencer Pelton as the third signatory The motion was amended to read "to appoint the State Archaeologist" as the third signatory so it could be transferred to any future holder of this position. Carried. Spencer Pelton will assume that position.

ELECTION OF OFFICERS.

Sarah Allaun, chair of the nominating committee, which also included Marcel Kornfeld and Danny Walker, all of the June Frison Chapter presented the present slate of officers for another term; all have agreed to serve: John Laughlin (President), Rachael Shimek (First Vice-President), and Sarah Allaun (Second Vice President). Robin Carlson made a motion to retain the existing slate of officers for another year, second by Cher Burgess. Carried.

The nominating committee brought one name, Ivy Merriot, for member-at-large to the Foundation. Barb Vietti was then nominated by Rachael Shimek from the floor for the position. A secret ballot vote was cast by the voting delegates, and Barb Vietti was elected for a term ending in 2025.

2023 Nominating Committee.

The 2023 Nominating Committee will be again chaired by Sarah Allaun, second vice president. Other committee members are Sylvia Huber (Absaroka Chapter) and Naomi Ollie (Sheridan/Johnson Chapter).

Selection of site for 2022 Summer Meeting.

An invitation was extended by Marcel Kornfeld for a meeting at Hell Gap. After some discussion, it was moved by Robin Carlson that the meeting be there on the weekend of July 15-17, 2022, second by Charles Koenig. Carried.

Selection of site for 2023 Spring Meeting.

An invitation was extended by the Washakie Museum in Worland. There was some discussion regarding the hosting Chapter, and the decision was made that the Absoraka Chapter and Pumpkin Buttes Chapter will discuss the hosting duties and make a decision. A motion was made by Wes Huber to hold meeting at Washakie Museum in Worland in the spring of 2023, seconded by Leroy Dike. Carried.

Introduction of Officers.

The existing officers were acknowledged as continuing, and Barb Vietti was presented to the group.

C**orrespondence.**

There was no correspondence to report.

Miscellaneous.

A motion was made by Dave Vlcek to thank the Sheridan/Johnson County Chapter for their hard work, seconded by Charles Koenig. Carried with a round of applause.

Amanda Castaneda announced they have T-shirts in the back with a design by Shane McCreary. They also have bandanas for sale.

John Laughlin brought up updating the WAS logo,

and there was a short discussion about if submissions could be solicited or we can hire someone. Hillary Jones volunteered to help with a new design.

Mary Hopkins notified everyone that there are two rounds of grant reviews by the Wyoming Cultural Trust. She reminded people there is money available and the Board loves archeological proposals. Renee Bovee administers the trust.

Jean Garrison presented a 10-minute program about her *UW Profiles in Wyoming Resilience Research Project* she is conducting whereby people share photos of the state that are important to them.

The Wyoming Archaeological Foundation will meet at 4:45 this afternoon in the Chaparral Room.

The Silent Auction closes at 4:45 pm, and you must pick up your items before banquet.

All those attending the lecture and demonstration at Fort Phil Kearny tomorrow should meet at the Fort at 9 am. It is planned for outside so dress appropriately.

ADJOURN.

A motion was made to adjourn by Leroy Dike, seconded by Carmen. The meeting adjourned at 9:48 am.

Banquet Awards:

The Golden Trowel Award for 2022 was awarded to: Robin Carlson and Leroy Dike

2022 Scholarships were awarded to:

AWARD	RECIPIENT	AMOUNT
Frison	Nick Bryant	500
Frison	Dave Kolkema	500
Jensen-Robson	Chase Mahan	375
Jensen-Robson	Charles Koenig	375
Mulloy	Grace Stanford	
Mulloy	Kaley Collins	
Mulloy	Clifford White	
Reiss	Irja Sandvik	500
Reiss	Baillie Brandt	400
Reiss	Melissa Branson	400
Reiss	Dakota Buhmann	400
Reiss	Elin Moorman	400
Reiss	Nathan Davis	400

Submitted by
Mavis Greer substituting for
Carolyn Buff, Executive Secretary/Treasurer

Treasurer's Report for Fiscal Year Ending March 31, 2022

RELIANT FEDERAL CREDIT UNION

CHECKING ACCOUNT	INCOME	EXPENSES	BALANCE
Beginning Balance			$3,153.43
Deposits	$6,599.00		
Interest Earned	$1.00		
TOTAL INCOME - Checking			$9,753.43

EXPENSES	
PIRL-Donation included in total for scholarship donation	$50.00
Wyoming Archaological Foundation - Annual Dues - 2020 and 2021	$503.00
Wyoming Archaeology Month and Fair	$250.00
Jochina Milar - Reiss Scholarship	$500.00
Clifford White - Reiss Scholarship	$500.00
Kalley Collins - Reiss Scholarship	$500.00
Brayden Winish - Reiss Scholarship	$500.00
History Day	$100.00
SAA - Annual COAS Dues	$35.00
Reliant Federal Credit Union - Visa - Secretary of State ($25 refunded due to SOS error)	$52.00
United State Postal Sercice - Permit #24 Fee	$265.00
United State Postal Sercice - Postage	$500.00
Danny Walker - $86.13 Mailing; $477.90 BLM Grant	$564.03

WAPA - History Day		$100.00	
Bloedorn Lumber - Trowel		$17.99	
Transfer to Reiss Certificate of Deposit per Chris Reiss		$500.00	
TOTAL EXPENSES		$4,937.02	
ENDING BALANCE - Checking Account			$4,816.41

SAVINGS, MONEY MARKET, CERTIFICATES OF DEPOSIT

SAVINGS ACCOUNT		
BEGINNING BALANCE		$125.85
Interest Earned	$0.11	
ENDING BALANCE		$125.96
MONEY MARKET ACCOUNT - 0040		
BEGINNING BALANCE		$7,879.09
Interest Earned	$5.06	
ENDING BALANCE		$7,884.15
MONEY MARKET ACCOUNT - 0041 (BLM)		
BEGINNING BALANCE		$9,390.52
Interest Earned	$6.04	
ENDING BALANCE		$9,396.56

Total available after March 31, 2021 = $3,776.19 for Big Horn Basin projects, digitization, and report-writing

CERTIFICATE OF DEPOSIT - 00100		
BEGINNING BALANCE		$48,400.79
Interest Earned	$292.50	
ENDING BALANCE		$48,693.29
CERTIFICATE OF DEPOSIT - 0101 - Reiss Account		
BEGINNING BALANCE		$15,620.07
From Checking per Chris Reiss	$500.00	
Interest Earned	$36.04	
ENDING BALANCE		$16,156.11
TOTAL INCOME AND ASSETS 2022		
Total Expenses		$4,937.02
2022 NET		$87,072.48
2021 Net Worth, Brought Forwatd		$752,786.76
Net Increase (Decrease)		$11,795.72

Carolyn M Buff
Executive Secretary/Treasurer

VARIETIES OF CORNER-NOTCHED ARROW POINTS IN WYOMING

by
David G. Eckles

An examination of corner-notched arrow points in Wyoming is presented. Emphasis will be on points commonly included in the Rose Spring/Rosegate series with an analysis of other corner-notch arrow points which are probably not part of the Rose Spring/Rosegate series. Data were gathered from both excavated and dated components as well as from surface recorded sites in Wyoming. These data were searched in the Wyoming SHPO Cultural Records Office databases from the early 1970s through 2014 (the 2014 cutoff is somewhat arbitrary, but was chosen due to the lag in receipt and input of reports and site forms into the Cultural Records database). Most of the data are contained in compliance related reports and site forms which constitute the bulk of references used. In addition, catalog cards housed at the University of Wyoming Archaeological Repository (UWAR) and several collections at UWAR and the University of Wyoming Anthropology Department were examined. Articles in the *Wyoming Archaeologist* journal from the 1950s to the present were also searched for information on the topic. Articles in peer reviewed journals and other academic publications were also searched. In addition to compiling sites with Rose Spring/Rosegate points, sites with Late Archaic corner-notched dart points (ca. 3000-1500 B.P.) and Late Prehistoric Shoshonean Suite points (*sensu* Larson and Kornfeld 1994, ca.650-150 B.P.) were compiled for comparative purposes. Site data were compiled in Excel spreadsheets, copies of which were provided to SHPO Cultural Records.

THE ROSE SPRING SERIES

The Rose Spring corner-notched arrow point series was named for the Rose Spring site in southeastern California (Lanning 1963). Rose Spring points are slender, generally symmetrical triangular corner-notched points with stems parallel-sided or expand toward the base (Holmer and Weder 1980:56-59). The points are barbed or straight-shouldered and blade edges often serrated (Lanning 1963:252). In the Great Basin, Rose Spring replaces Elko dart points and precedes the development of Desert Side-notched and Cottonwood unnotched arrow points (Justice 2002:320-321). It is thought Rose Spring represents the first development of bow and arrow technology in the Intermountain West (Blitz 1988). Dating of Rose Spring arrow points has generally been thought to range from about 650-1650 radiocarbon years before present (Justice 2002:321). The original excavations at the Rose Spring site were not dated, but later reanalysis of the site assemblages provided a revised date of 1600 B.P. for the Rose Spring component (Yohe 1998).

Earlier dated components with Rose Spring points have been reported from southeastern Utah (Geib 1996, Geib and Bungart 1989) with radiocarbon dates in the 1800-1900 B. P. range. Another site in northeastern Utah was dated between 1840-1960 B.P. on fill from a hearth which also included a Rose Spring projectile point (McKibben 1992:300). In southwestern Idaho, Rose Spring points were dated in excess of 2000 B.P. (Webster 1980:65).

Some researchers have combined Eastgate projectile points (Thomas 1981) with Rose Spring to designate a series or cluster called Rosegate. Eastgate points typically have larger more prominent expanding barbs and a tendency for straight stems (Justice 2002:324).

In an analysis of Great Basin projectile points, Thomas (1981) established metric criteria to distinguish Rose Spring/Rosegate points and these criteria are used here for projectile points in Wyoming (hereafter referred to with the initials RS/RG). Thomas' requirements for inclusion in the RS/RG

series are the base width is less than or equal to 10 mm; the neck width is less than or equal to the base width plus 0.5 mm; and the proximal shoulder angle is between 90-130 degrees (Thomas 1981:19). Karpinski (2004) also used these parameters in a study of surface finds in southwestern Wyoming, and on this basis, there is overall agreement with Karpinksi's classifications and those presented here.

There is a range of variation in Wyoming corner-notched arrow points which have commonly been referred to as RS/RG. I grouped these points into three variants based largely on basal attributes. Line drawings and photographs of selected points from Wyoming show this variation (Figures 1-2). These variants are also common in most parts of Utah (Geib 1996, McKibben 1992) often co-occurring

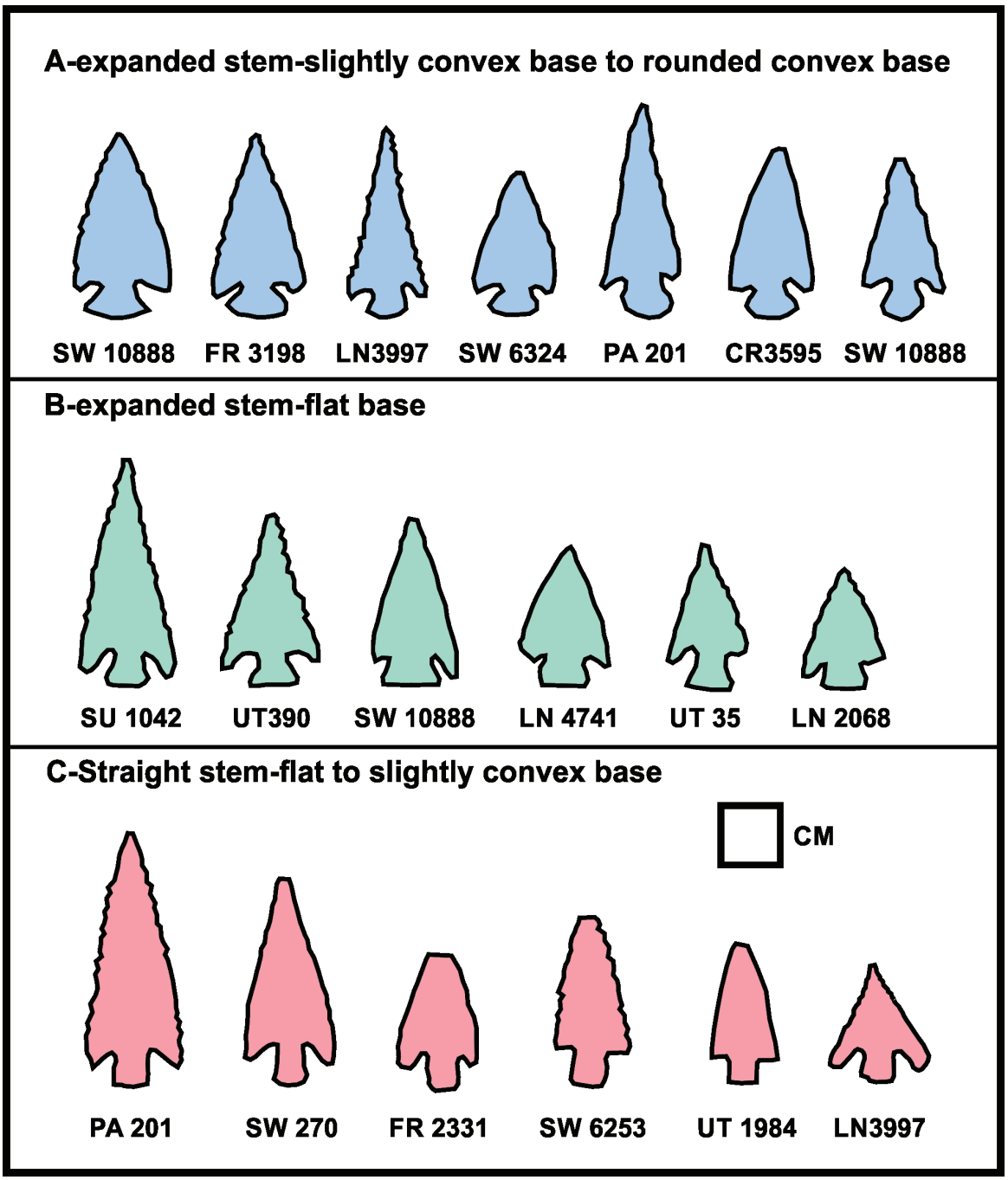

Figure 1: Line drawings of selected Rose Spring/Rosegate point variants from Wyoming and associated site numbers.

Figure 2: Wyoming RS/RG Points, Variant A (a-d), Variant B (e-h), Variant C (i-l), scale in cm.

with Fremont ceramics (Holmer and Weder 1980) and northwestern Colorado (e.g., Breternitz 1970, Cassells 1997, Stone 1999).

Variant A contains triangular points with an expanded stem and convex to steeply convex, nearly rounded bases. This is the most common variant in Wyoming. Similar examples have been documented from sites throughout Utah such as Cowboy Cave (Jennings 1980:33), Danger Cave (Jennings 1957), Hogup Cave (Aikens 1970), and the Glen Canyon region (Geib 1996) among many others. This variant is also present in northwestern Colorado (e.g., Cassells 1997, Landt 2018, Metcalf 2011). There are not exact equivalents in the Rose Spring (California) type site, although there are some examples with expanded stems and relatively wide, slightly convex bases. This variant may be a case of stylistic drift as the technology spread over time from the Great Basin into Wyoming. Selected examples from Wyoming are shown (Figures 2a-d).

Variant B contains triangular points with expanded stems with flat bases (Figures 2e-2h). This is the least common variant in Wyoming. There is at least one similar example in the Rose Spring (California) site assemblage.

Variant C generally exhibits straight to slightly expanded stems. This includes the Eastgate point and stemmed variety which has a straight stem and horizontal to slightly acute angled ears. The latter tend to be found in components dating from roughly 1500 to over 1800 B.P. in Wyoming (hereafter referred to as "early stemmed"). Examples similar to the "early stemmed" variant are present in the Rose Spring type site as well as early dated sites in Utah (Geib 1996, McKibben 1992) and Idaho (Webster 1978). Variant C points are also common in Utah and northwestern Colorado sites (see e.g., Metcalf 2011). Variant C points are shown (Figures 2i-l), including an "early stemmed" example (Figures 2k-j) and one Eastgate example (Figure 2l).

In Wyoming, RS/RG points have been found in a large number of sites, especially in the southwestern counties (Sweetwater, Lincoln, Uinta, Sublette) (Thompson et al. 2000:466-467), with fewer sites in the south-central, central, north-central and northwestern portions of the state. Few to no RS/RG points are known from the eastern portion of Wyoming, either as surface finds or in dated con-

texts. RS/RG points are often associated with the Fremont tradition in Utah, northwestern Colorado and southwestern Wyoming (Thompson and Pastor 1995). Fremont ceramics in Wyoming have been dated from 880-1650 B.P. (Smith 1992).

RADIOCARBON DATING

Results of the current project found 93 dated components or deposits in the state containing RS/RG points. Given the number, these data are listed in Appendices A-D; each component or dated deposit also lists the variants present. Based on these data, sites with RS/RG points in Wyoming date from about 800-900 to over 1800 radiocarbon years before present, with a peak range from about 1100 to 1500 radiocarbon years before present (in all cases the measured radiocarbon date was used as reported) (Figure 3). The trend depicted has been noted by many of the authors of the references cited in this article.

Variants A, B and C occur throughout the time range; only the so-called "early stemmed" (placed within Variant C) points appear to be restricted to the early part of the time range. Eastgate points have been found in dated contexts (n=6) in Lincoln, Uinta and Sweetwater counties (see Appendix B). Surface finds of the Eastgate point have been recorded in Lincoln (48LN1128, 2461 and 3069), Uinta (48UT1 and 1308), Sublette (48SU108 and 260) and Sweetwater (48SW1645, 1656, 13151 and 18610) counties. The so-called "early stemmed" points have been found in dated components in Uinta, Lincoln and Sweetwater counties (see Appendix B). Fifty-six dated components contained only one of the variants, 29 contained two of the variants and eight contained all three of the variants.

UNKNOWN CORNER-NOTCHED ARROW POINT

It should be mentioned, there is a distinctive corner-notched arrow point which does not fall within the parameters for RS/RG points as used here. It is rare but occurs in several of the counties with RS/RG points. It is a triangular, symmetrical point with a wide, generally flat base and deep, wide corner notches (Figure 4). Counties with these points include Big Horn (n=2), Carbon (n=13), Fremont (n=1), Lincoln (n=1), Natrona (n=2), Park (n=3) and Sweetwater (n=4). One of these points was recovered in a dated component (1240+/-40 B.P.) at site 48CR7309 (Fleming et al. 2010). It was referred to as "Avonlea-like," and exhibits slight similarities to possible Avonlea corner-notched points from the Beehive site (Frison 1991, Hall 1998). Whether this point is a Wyoming RS/RG variant or part of another tradition is at this time unknown.

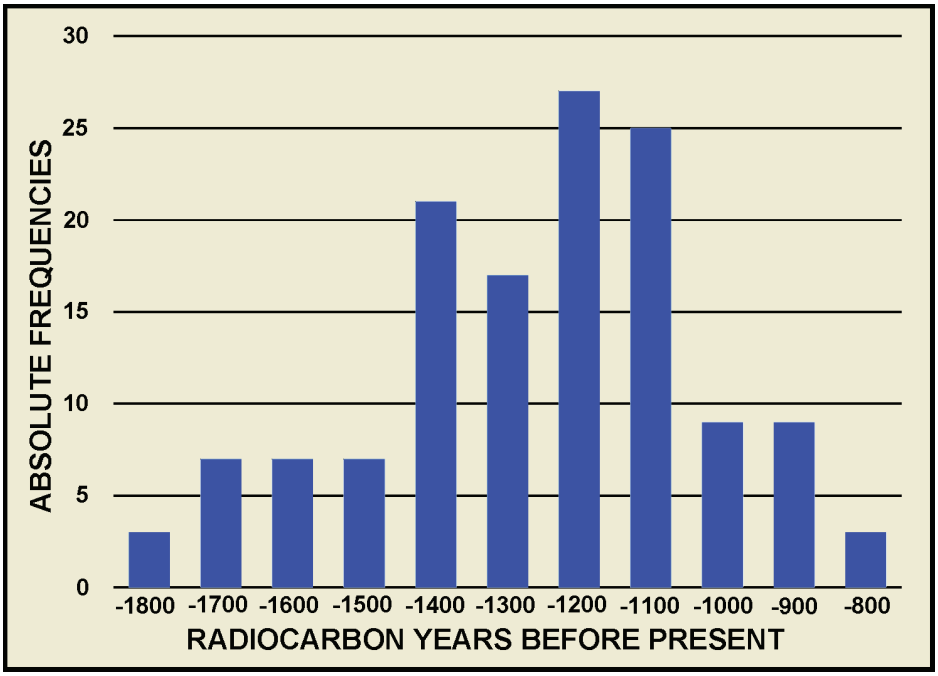

Figure 3: Graph of all radiocarbon dates, RS/RG components in 100-year increments.

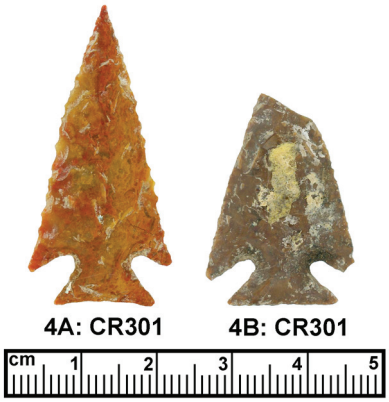

Figure 4: Examples of unknown corner-notched arrow points (48CR301), scale in cm.

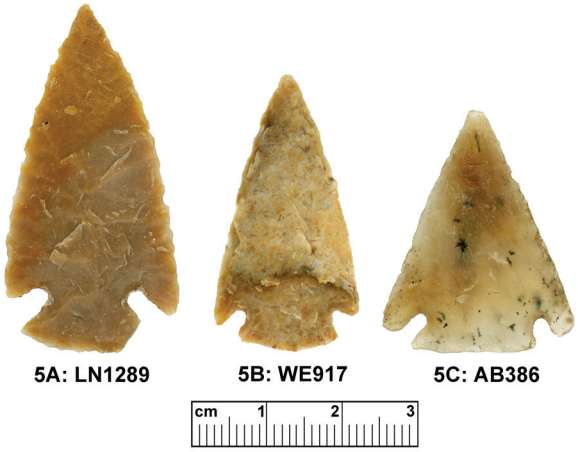

Figure 5: Examples of Late Archaic corner-notched dart points from dated sites, scale in cm.

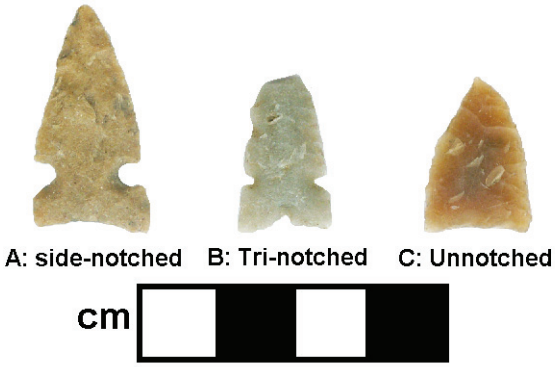

Figure 6: Examples of Shoshonean Suite points (48CR301), scale in cm.

GEOGRAPHIC DISTRIBUTION

The geographic distribution of RS/RG arrow points is variable within Wyoming. In general, points within the series occur with greatest absolute frequencies in the southwestern (Lincoln, Sweetwater, Sublette counties), south-central (Carbon County) and central (Fremont County) portions of the state. Lower frequencies occur in the northwestern counties (Park, Hot Springs), Natrona County (central) and Uinta County (southwest). Few to no RS/RG points have been recorded in the eastern third of Wyoming.

To represent densities of RS/RG points in Wyoming, data from excavated sites as well as surface sites were compiled. This included searches of site forms for each county and data recovery reports and research publications. In addition, data on sites with Late Archaic period corner-notched dart points (CND) from the time range of about 3000-1500 B.P. such as found at the Medicine Lodge Creek site (Frison 2007) and the Garrett Allen site (Eckles 2013), were compiled as well as sites with Late Prehistoric arrow points (ca. 650-150 B.P.). These have been referred to as the Shoshonean suite (Larson and Kornfeld (1994) and includes side-notched, side and basal notched and unnotched points (SHOS). Examples of Late Archaic CND and Late Prehistoric SHOS points are shown (Figures 5-6).

It should be noted the intensity of surface inventory is variable across Wyoming. The counties with the highest level of compliance survey are Sweetwater, Carbon, Campbell and Sublette. Somewhat fewer surveys have been conducted in Fremont, Natrona, Lincoln, Converse, Uinta, Park and Bighorn counties. Counties with low survey coverage include Sheridan, Crook, Weston, Albany, Platte, Hot Springs, Washakie, Teton and Yellowstone National Park. Comparatively little survey has been conducted in Laramie, Niobrara, Goshen and Hot Springs counties.

Given this caveat, it is the case both CND and Shoshonean Suite points have been found throughout Wyoming and are therefore potentially useful as baselines for comparison. The absolute frequencies of RS/RG, CND, and SHOS points by each county and ratios of RS/RG to CND and RS/RG to SHOS are presented (Table 1). The ratio of RS/RG to CND is shown graphically (Figure 7) (the ratios of RS/RG to Shoshonean suite points show a similar pattern).

If these data accurately portray the distribution of points in the state, there are high frequencies of RS/RG points in the southwestern counties (Uinta, Lincoln, Sublette, Sweetwater). Proceeding east and

Table 1: Projectile Point Ratios by Wyoming Counties, West to East.

County	Sites w/ RS/RG	Sites w/ CND	Sites w/ SHOS	Ratio RS/RG to CND	Ratio RS/RD to SHOS
Northern Tier					
Yellowstone NP	5	52	20	0.096	0.250
Teton	12	41	19	0.293	0.632
Park	29	79	57	0.367	0.509
Hot Springs	7	24	12	0.292	0.583
Washakie	6	61	28	0.098	0.214
Big Horn	5	126	62	0.039	0.081
Sheridan	0	39	27	0.000	0.000
Johnson	0	122	67	0.000	0.000
Campbell	0	303	121	0.000	0.000
Crook	0	72	36	0.000	0.000
Weston	0	50	17	0.000	0.000
Middle Tier					
Sublette	260	367	153	0.708	1.699
Fremont	124	230	113	0.539	1.097
Natrona	70	230	94	0.304	0.744
Converse	0	122	55	0.000	0.000
Niobrara	0	8	4	0.000	0.000
Southern Tier					
Lincoln	163	224	77	0.728	2.126
Uinta	80	106	50	0.755	1.600
Sweetwater	574	785	283	0.731	2.028
Carbon	247	510	210	0.484	1.176
Albany	4	39	16	0.102	0.250
Platte	1	73	26	0.014	0.038
Goshen	0	11	8	0.000	0.000
Laramie	0	24	11	0.000	0.000

RS/RG=Rose Spring/Rosegate, CND= Late Archaic corner-notched dart, SHOS=Shoshonean Suite

north, the ratios show decreasing densities of RS/RG points in Fremont, Park, Hot Springs, Natrona, Carbon and Teton counties and Yellowstone National Park. Proceeding north and east from Natrona and Carbon counties, there are quite dramatic decreases in RS/RG densities for the remaining counties. In fact, there are no known examples of RS/RG points in Laramie, Goshen, Niobrara, Weston, Crook, Campbell, Johnson and Sheridan counties with only a few examples in Albany, Platte, Converse, Washakie and Bighorn counties.

It is clear RS/RG projectile points are restricted geographically in Wyoming. This may not be surprising given the RS/RG phenomenon has its roots in the Great Basin, with an apparent spread into the intermountain basins of southwestern, south-central, central and northwestern Wyoming. As mentioned above, within Variant C are the so-called "early

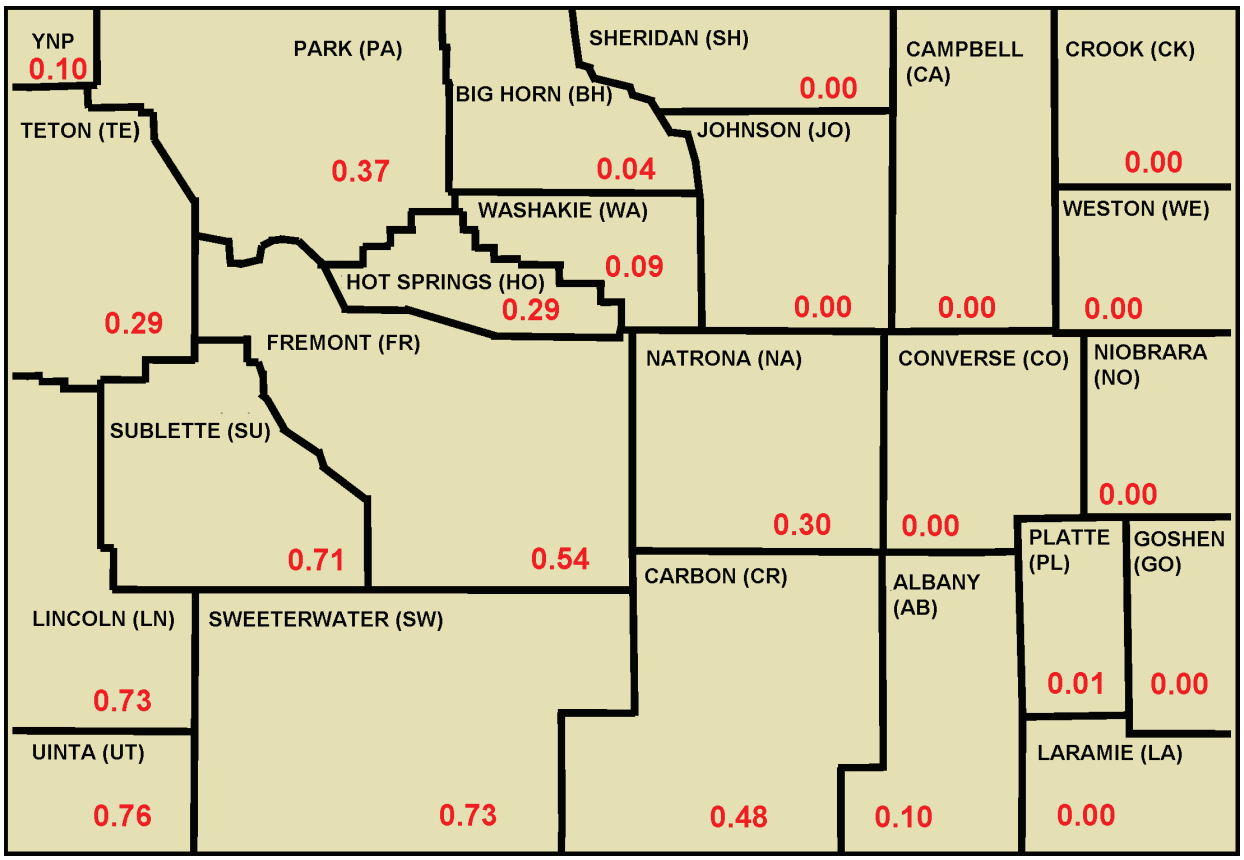

Figure 7: Ratio of RS/RG to CND by Wyoming county (rounded up to two decimals).

stemmed" examples which appear to be restricted to the early part of the date range and occur only in southwestern Wyoming. They occur in dated sites in Lincoln, Uinta and Sweetwater counties, with surface finds in these counties as well as southwestern Fremont County. Eastgate examples are present in dated sites and as surface finds in Lincoln, Sublette, Uinta and Sweetwater counties.

Radiocarbon dated sites with RS/RG points are concentrated in the southwestern counties throughout the time sequence. Away from this "core" area, to the north and east, there are fewer dates overall and fewer dates from the early part of the sequence and somewhat more dates in the latter part of the sequence. Between 1500-1100 B.P. dated RS/RG components occur throughout southwestern and south-central Wyoming with several sites in central and west-central Wyoming. There is only one dated component in the northwestern part of the state (Mummy Cave) in Park County (Husted and Edgar 2002). After about 1100 B.P., the range constricts and by 900-800 B.P., there are only a few sites dated to this time in southwestern Wyoming.

These points occur in dated components and as surface finds primarily in the intermountain basins of western and south-central Wyoming. Few RS/RG have been recorded at higher elevations in alpine settings and the foothills of the major mountain ranges. Taken as a whole, only 3.6 percent of all RS/RG points examined in this study have been found in alpine and foothills settings in the counties containing both high elevation mountain ranges and intermountain basins. In contrast, 18 percent of Late Archaic corner-notched dart points have been found in alpine and foothills settings of the major mountain ranges. Still, the RS/RG assemblage found at Mummy Cave (48PA201) in the northwestern Wyoming mountains might be a cautionary tale, given few sites of this age have been found and investigated in this area.

OTHER CORNER-NOTCHED ARROW POINTS

There are other corner-notched arrow points in the eastern portions of the state which are probably not part of the RS/RG series. These are considered

below. A somewhat common corner-notched arrow point in eastern Wyoming is shorter in height with a generally much wider, slightly convex to flat base compared to the RS/RG series, especially Variant A as presented here. Most of the specimens are asymmetrical (including blades, bases and positioning of the corner notches), an uncommon attribute among RS/RG points (Figure 8).

These points are similar to those of a suggested type in Colorado called Hog Back (Nelson 1971) and quite asymmetrical points found at the LoDaisKa site near Denver (Irwin and Irwin 1959). In eastern Colorado and the central Plains, these small arrow points often co-occur with cord marked ceramics (for a summary of these data, see e.g., Gilmore and Larmore 2003) and have been referred to as Woodland complexes (Butler 1998). Most of the Woodland sites have been found in the northern Colorado Front Range and northeastern Colorado, dating from about 1700 to 900 years before present (Cassells 1997:192-197, Gilmore and Larmore 2003).

It is possible short, wide base corner-notched arrow points (often asymmetrical) in Wyoming are an extension of Woodland complexes found to the south and east. For lack of a better term, they will be referred to here as Woodland corner-notched arrow points. A list of excavated sites with these artifacts in Wyoming is shown (Table 2). Several of these sites also contained cord marked (Woodland) ceramics. Radiocarbon dates, when present, indicate a range of about 1200-800 years before present.

A simple comparison of RS/RG and Woodland points is shown (Figure 9). Examples of each from dated components using a date range between 1200-800 radiocarbon years before present were employed. This is a scatter plot of the total width divided by total height and base width divided by total height (in millimeters) of complete points. These metrics were chosen given the observed differences in height and base width between the two-point series. There appear to be two separate clusters, one for RS/RG points in the western counties of Wyoming and one for Woodland points in the eastern counties.

Overall, the ratio of width to height ranges from about 0.3 to 0.6 for Rose Spring and 0.5 to over 0.8 for Woodland. Base width to total length ranges from 0.41 to over 0.62 for the Woodland examples while the Rose Spring points have a ratio of about 0.15 to 0.36. There appears to be some separation between the two-point series based on these metrics.

The distribution of Woodland points appears to be concentrated in the eastern portion of the state, including Laramie, Albany, Platte, Converse, Campbell, Goshen and Johnson counties. In Natrona and

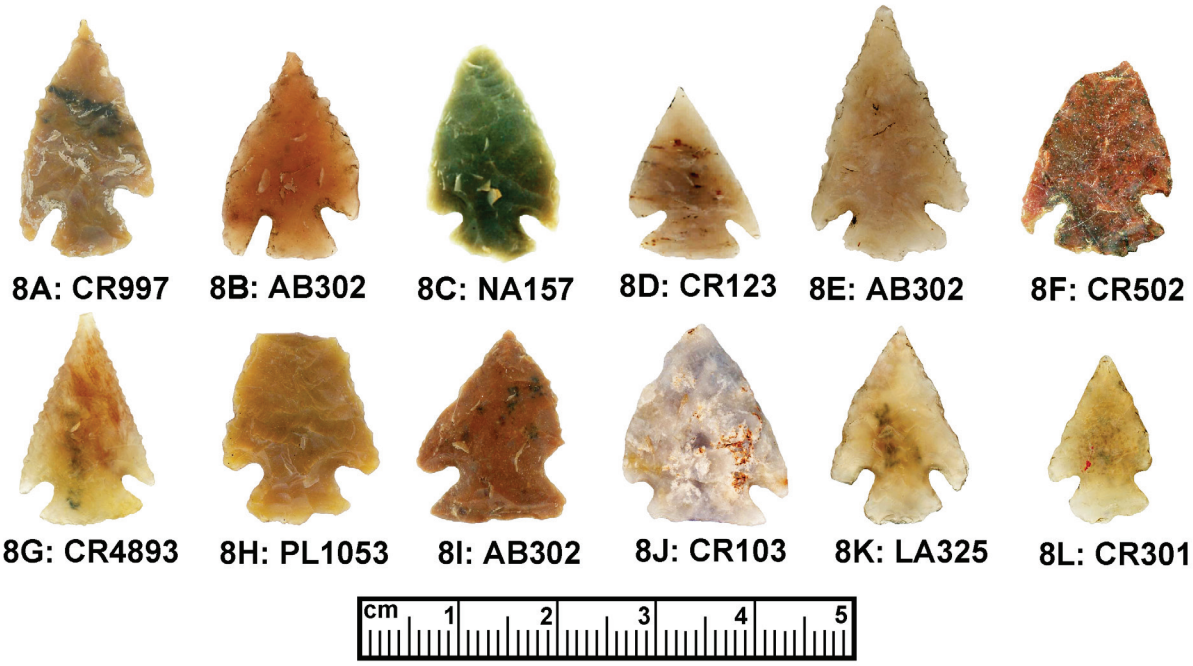

Figure 8: Examples of probable Woodland points from Wyoming sites (scale in cm.).

Table 2: Excavated Sites in Wyoming with Probable Woodland Corner-notched Arrow Points and/or Cord-marked Ceramics.

Site Number	Location WY	Co-occur w/ ceramics	Radiocarbon Date	Reference
AB301	Southeast	Cord marked	Not dated	Zeimens 1975
AB130	Southeast		Not dated	Bupp 1981
AB302	Southeast	Cord marked	Not dated	Reher 1971, UWAR
AB305	Southeast	"Thong" marks	Not Dated	Gebhard et al. 1964
CA553	East-central		990+/-70	Peterson et al. 1982
CO637	East-central		1160+/-80	Hall et al. 1983
CO2640	East-central	Beads, figurines	1100+/-40	Munson 2008
CR123**	South-central	Cord marked	950+/-110 1060+/-100	McGuire and Joyner 1981
CR301*	South-central	Cord marked	ca. 920+/-110	Eckles 2013
CR502	South-central		1050+/-100	Tibesar 1981
CR997, Stratum 1	Central		1060+/-100 1140+/-110	Moe and Todd 1982
CR2538	South-central		1090+/-50	McGuire et al. 1984
CR2582	South-central		1100+/-50	McGuire et al. 1984
CR2624	South-central		1150+/-60	McGuire et al. 1984
FR3842	Central		1050+/-60	Martin and Smith 1999
GO54***	Southeast	Cord marked	1150+/-90	Korell 1989
GO302	Southeast	Cord marked	Not dated	Reher 1971
JO303	North-central		1140+/-150	Grey 2004
JO315	North-central		975+/-180	Anonymous 1969
LA304	Southeast	Cord marked	800+/-80 930+/-60	Frison 1991:36 Reher 1971
LA311	Southeast	Cord marked	Not dated	Reher 1971
LA312	Southeast	Cord marked	1060+/-90 1080+/-70	Frison 1991:36 Reher 1971
LA325*	Southeast	Cord marked	1080+/-180 1130+/-110	Frison 1991:35, and UWAR catalog cards
NA326	Central		1020+/-86	Randall 1963, and UWAR catalog cards
NA1431	Central		1080+/-80	Martin et al. 1999
PL29	East-central		1025+/-150	Mulloy and Steege 1967
PL951	Southeast		1180+/-60	Reiss 2000
PL709	Southeast	Cord marked	940+/-70	Zeimens et al. 1992

* Point(s) in mixed deposits with other LA and LP points
** Points found on surface, CM ceramics from test unit with radiocarbon dates
*** Ceramics only

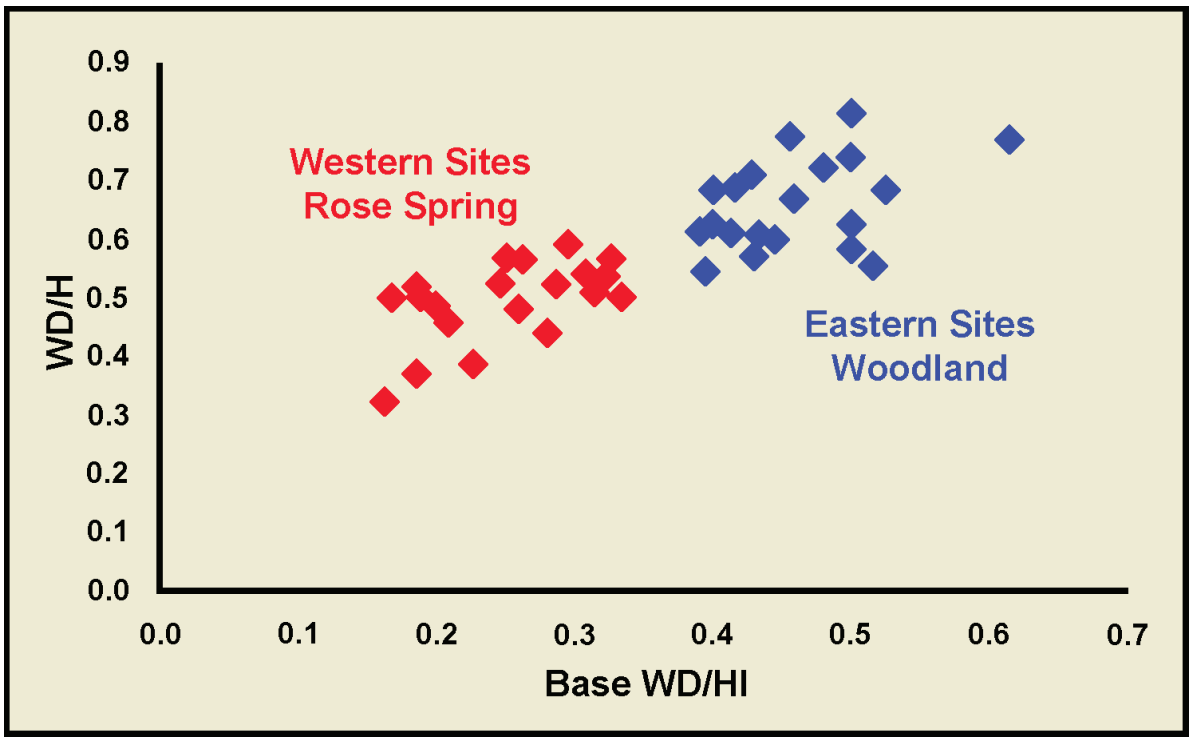

Figure 9: Ratios of total width/total height by base width/total height for dated sites (1200-800 B.P.) with corner-notched arrow points, western counties and eastern counties, Wyoming.

Carbon counties, they appear to be concentrated in the eastern portions of these counties. In addition to the excavated sites (Table 2), cord marked ceramics have been recorded from surface sites in eastern portions of Carbon and Natrona counties, Albany, Laramie, Goshen, Platte, Converse, Campbell and Johnson counties, roughly in the eastern one-third of the state (it should be noted cord-marked ceramics also co-occur with Late Archaic age Besant points and Late Prehistoric Upper Republican components).

Similarly with RS/RG points, there is a drop-off in Woodland point densities from east to west. This dynamic is shown (Table 3) and included points in both dated and surface contexts. Points referred to here as Woodland occur in the eastern counties, but rarely if at all in the central and western counties. Interestingly, there are sharp drop-offs of RS/RG points between Park and Big Horn counties, Hot Springs and Washakie counties, and the eastern portions of Natrona and Carbon counties compared to the eastern portions of these two counties.

Taking a closer look at Carbon and Natrona counties, absolute frequencies of sites with RS/RG series and Woodland points were compiled for the western and eastern halves of each county (dividing line between range 85/84 for Carbon County and 84/83 for Natrona County) (Table 4).

In both cases, there are more RS/RG points compared to Woodland points in the western portions of these counties with relatively more Woodland points in the eastern portions. It should be noted considerably more compliance related survey has been conducted in the western portions of both counties, possibly resulting in a biased view of these counties as a whole. Even so, relatively few Woodland points compared to RS/RG occur in the western portions of the counties.

Lithic raw material sources for RS/RG points in the eastern portions of Carbon County tend to be from sources located in south-central and southwestern Wyoming (fossiliferous cherts, zebra flint, Bridger Fm. cherts). At the Garrett Allen (Elk Mountain) site, 48CR301, located in south-eastern Carbon County, RS/RG points are dominated by the above-mentioned raw materials, while the Woodland points are dominated by east-central Wyoming dendritic agates and Spanish Diggings orthoquartzites, jaspers likely from east-central Wyoming and Flattop chalcedonies from northeastern Colorado

Table 3: Sites with Woodland and RS/RG Points in Selected Counties, East to West.

County	Sites w/ Woodland points	Sites w/ RS/RG points
Southern Tier		
Laramie	10	0
Goshen	4	0
Platte	23	1
Albany	19	4
Carbon	53	247
Sweetwater	8	574
Uinta	0	80
Lincoln	0	163
Middle Tier		
Niobrara	4	0
Converse	33	0
Natrona	22	70
Fremont	4	124
Sublette	0	260
Northern Tier		
Campbell	27	0
Johnson	32	0
Big Horn	10	5
Washakie	6	6
Hot Springs	4	8
Park	0	29

(Eckles and Guinard 2015). Examination of collections from 48CR997 (Moe and Todd 1982) in northeastern Carbon County and 48AB301 and 48AB302 in western Albany County show a similar pattern: RS/RG points are from raw material sources in south-central and southwestern Wyoming and Woodland points are from eastern sources.

CERAMIC ASSOCIATIONS WITH RS/RG AND WOODLAND POINTS

As noted above, RS/RG points often co-occur with Fremont tradition ceramics while Woodland points as suggested here sometimes co-occur with cord-marked ceramics. There appears to be an east/west divide between the Woodland and RS/RG series points, and there is a similar east/west divide between cord-marked (Woodland) and Fremont ceramics.

Table 4: Rose Spring/Rosegate and Woodland Points in Carbon and Natrona Counties, West to East.

Carbon	West	East	Totals
RS/RG	228	19	247
Woodland	15	38	53
Natrona			
RS/RG	66	4	70
Woodland	7	15	22

During the course of compiling data on projectile points, sites with Fremont and cord-marked ceramics were also tabulated. This includes data from both dated components and surface sites. Again, given the numbers, sites with these ceramics are presented in Appendix E (Fremont) and Appendix F (cord-marked). Sites with examples of the two ceramic traditions are illustrated (Figure 10).

The distribution of Fremont ceramics in southwestern and south-central Wyoming and cord-marked (Woodland) ceramics in southeastern Wyoming parallels RS/RG and Woodland projectile points. There appears to be a transition area in Carbon and Natrona counties with greater densities of RS/RG points in the western portions of these counties and greater densities of Woodland points in the eastern portions. Only a few examples of Woodland points have been found in extreme eastern Sweetwater County and southeastern Fremont County and only a few examples of RS/RG in Albany County. A similar dynamic appears to be the case between Park and Hot Springs counties to the west and Big Horn and Washakie counties to the east, that is, greater densities of RS/RG points in the former with few examples in the latter.

BURIALS WITH RS/RG POINTS EMBEDDED IN BONE

ROBBER'S GULCH BURIALS (48CR3595)

Three burials in south-central Carbon County were excavated in 1982. Two were sub-adults and one was an elderly male. The remains of the adult male had been placed (unceremoniously) in an alcove or crevice in the surrounding sediments. The

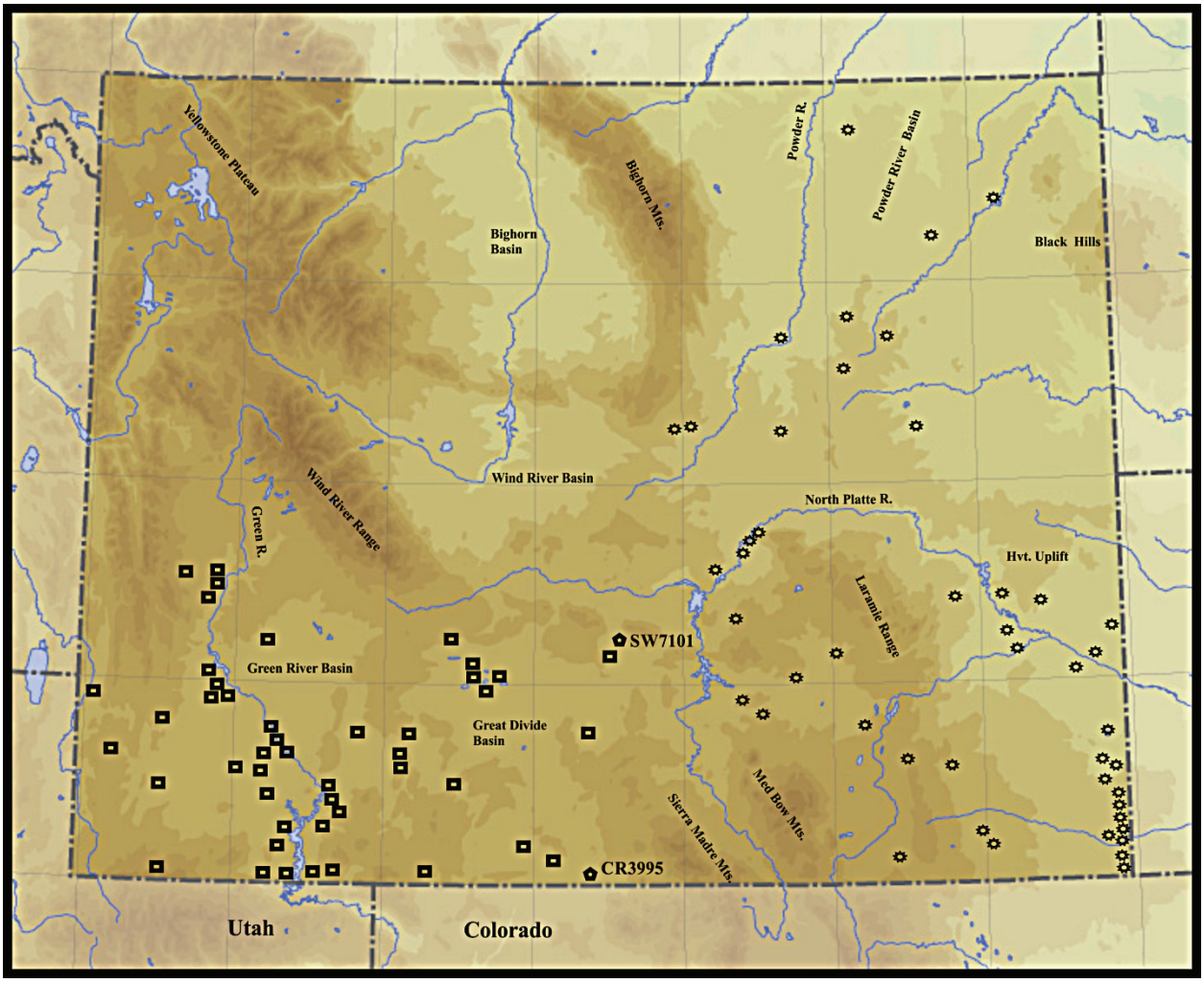

Figure 10: Distribution of Fremont (squares) and Woodland (stars) ceramics in Wyoming. Also depicted are the locations of two burials, 48CR3595 and 48SW7101 with RS/RG points embedded in bone.

sub-adults were located a short distance from the adult male in a similar setting. These remains were not dated.

During the excavation, corner-notched arrow points were observed lying directly on several skeletal elements or in close proximity of the adult male. Subsequent analysis revealed several of these points were embedded in bone (Eckles 1982, Gill 2010, Martindale and Gill 1983). All appear to be similar to points in the RS/RG series and include variants A and B as used here. All were made of lithic raw materials (fossiliferous cherts, Bridger formation chert and zebra flint, aka. tiger chert) found in south-central and southwestern Wyoming. One point is somewhat smaller compared to the rest and has a wider, slightly convex base (see Figure 1).

The two sub-adults include one probable male and one probable female. Near the female, a modified fresh water mollusk shell was recovered and identified as *Actinonaias carinata carinata*. This subspecies is present in the Mississippi River drainage system as far west as Arkansas and Kansas (Eckles 1982).

BAIROIL BURIAL (48SW7101)

A single adult male skeleton was recovered in extreme northeastern Sweetwater County which exhibited considerable blunt force trauma to the face area and a single RS/RG point embedded in its right patella and tibia (Gill 2010, Shields et al. 1989). A date of 1060+/-90 was obtained on bone from the skeleton (see Figure 10).

DEER BUTTE 2 BURIAL (48SW10878)

Another burial in central Sweetwater County contained the remains of a single adult male with a chipped stone (arrow?) point tip embedded in its sternum (Gill 1995). It was not dated. The type of point is unknown.

The Robber's Gulch and Bairoil burials are located in extreme southwestern Carbon County and extreme northeastern Sweetwater County in what appears to be the transition area between Fremont-RS/RG sites and Woodland sites in Wyoming. It is tempting to conclude in addition to a probable transition area between the two traditions, there was also conflict between them. This must remain a tentative conclusion given the small sample size of such burials and the causes of human conflict can have many sources.

COMPLICATIONS

A distinction between RS/RG and Woodland corner-notched arrow points has been presented above based on size and basal attributes. There appears to be a separation between the two-point series on the basis of several metrics, and a separation geographically. However, there are several sites with corner-notched arrow points which complicate this picture. No projectile point typology works perfectly given anomalies and inter grades of style. The following sites are examples of the problems inherent in any typology.

WILLOW SPRINGS BISON POUND (48AB130)

The Willow Springs bison pound contains Late Archaic and Late Prehistoric bone beds with multiple projectile points from these periods (Bupp 1981). Besant and CND points were found in the lower level, corner-notched arrow points were found in the middle level and Shoshonean suite points were found in the upper level. There appeared to be some mixing of artifacts between the middle and lower levels. The multiple episodes of bison trapping in the pound resulted in compression of the deposits, making it difficult to separate episodes (Bupp 1981). None of the levels within the site were radiocarbon dated.

Corner-notched arrow points recovered from the middle bone level (examples shown in Figure 11) were found to be similar to other corner-notched arrow points found in north-central and northeastern Colorado and southeastern Wyoming (Bupp 1981:55). Lithic raw materials were identified as coming from sources in east-central Wyoming and extreme north-central Colorado (Bupp 1981:89-90).

Many of these corner-notched arrow points closely resemble those found in Colorado sites often found in association with cord marked (Woodland) ceramics. However, some of the Willow Springs points are similar to points within the RS/RG series as discussed here. Using the ratios of width/height and base width/height as discussed above, there is no separation between RS/RG and Woodland points as shown above (Figure 9).

Given the compressed nature of the bone beds at the Willow Springs site, it was only possible to speculate as to the sequencing of the bison trapping (Bupp 1981). There may have been a Besant and CND episode in the lower level (or separate Besant and CND episodes). The upper level with Shoshonean points many have been a separate (and final) episode at the site. It is possible there were separate RS/RG and Woodland episodes, or perhaps there was one episode which included groups from the different traditions. Bupp (1981:77-85) attempted to reconstruct the episodes using several analyses, but none indicated any unambiguous results.

BATES HOLE SITE (48CR997)

Arrow points from the Bates Hole site (Moe and Todd 1982) were found in two dated strata, one clearly a RS/RG point (see Figure 2b) dated at 1370+/-110 B.P. (Stratum 2). As for points in Stratum 1 (dates of 1060+/-100 and 1140+/-110 B.P.), the picture is complicated. There are two points which could fit in the RS/RG series based on height and basal attributes (one with base missing). Raw materials are of fossiliferous chert and tan chalcedony. The other identifiable points (n=4) from Stratum 1 are of relatively shorter height with relatively wide flat to convex expanded bases. Two are asymmetrical (see Figure 12). Raw materials include dendritic agates and jasper, likely from east-central Wyoming sources.

MOUNTAIN MEADOW RANCH BURIAL (48AB459)

A single elderly female skeleton was discovered in a rock crevice near Woods Landing, Wyoming.

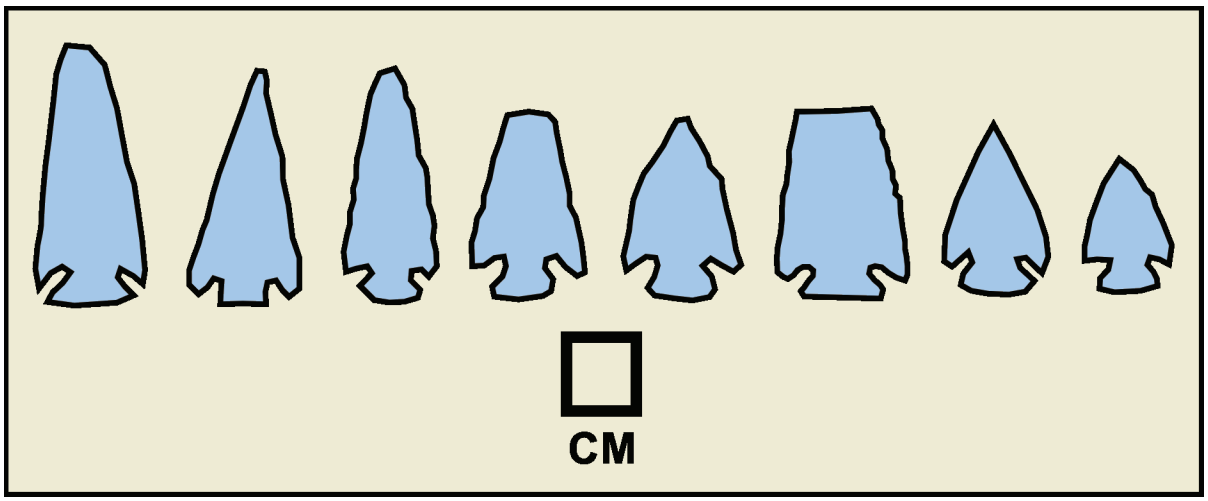

Figure 11: Examples of corner-notched arrow points from 48AB130, Willow Springs site.

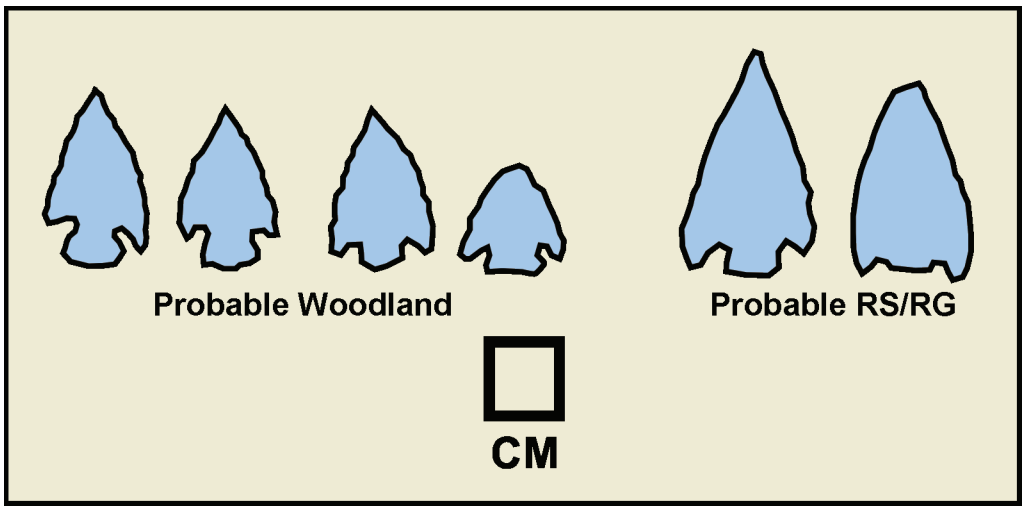

Figure 12: Corner-notched arrow points from Stratum 1, 48CR997.

Eight points which could be included in the RS/RG series were found in association with the bones but no trauma or conflict injuries were apparent on the remains (Truesdale and Gill 1994). The burial was not dated.

Metric analysis of the points by Truesdale and Gill (1994) showed most of these arrow points could be assigned to the RS/RG series with one example having attributes more consistent with the Woodland series. All of the raw materials were dendritic agates, likely from east-central Wyoming.

TURK BURIAL (48WA301)

The Turk Burial in north-central Wyoming contained multiple interments (Grey 1963). Grave goods included a Besant point and four corner-notched arrow points (it is not clear which of the skeletons is associated with the projectile points). A date of 670+/-160 B.P. was returned on bone from one of the skeletons (Frison 1991:35).

Line drawings of the arrow points are shown (Figure 13). The bases are quite wide (similar to Woodland) but of relatively greater height than the Woodland points discussed here. Because of their wide bases they would not fit in the RS/RG series as per Thomas (1981), but their overall height and serrated blade edges are more typical of RS/RG.

ROBBERS GULCH BURIALS (48CR3595)

One of the arrow points found lying under the elderly male skeleton at Robbers Gulch has a wider base and is of lesser height compared to all the other

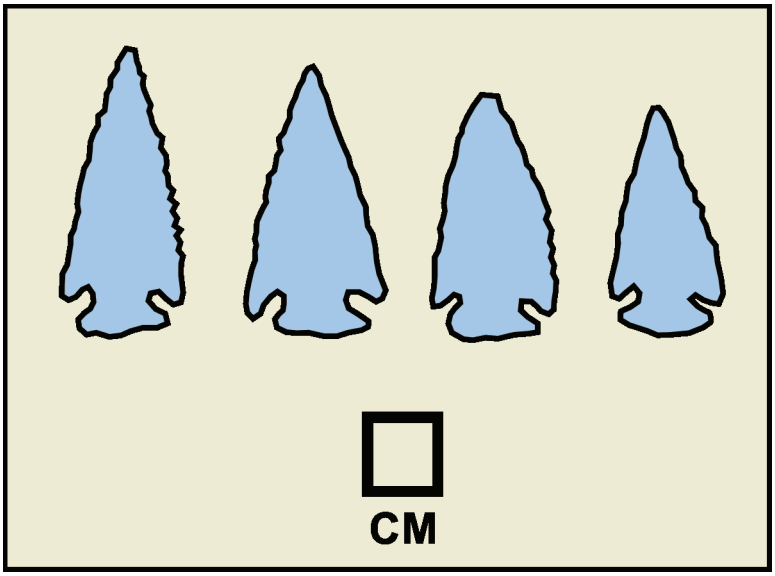

Figure 13: Corner-notched arrow points from Turk burial, 48WA301.

points. Based on the metric analysis above, it is within the RS/RG series range, but has similarities to the Woodland series as discussed here. All of the points from this assemblage are of raw materials found in south-central and southwestern Wyoming (Eckles 1982).

The above data show separating RS/RG (Variant A) and Woodland points may not be so straightforward, lacking clear association with Fremont or Woodland ceramics. This problem appears largely in the so-called transition area between the two traditions. It would appear some contact between these populations occurred at times.

DISCUSSION

Research during this study has shown the presence of corner-notch arrow points in Wyoming which appear to be similar to those from the Great Basin commonly referred to as the Rose Spring/ Rosegate (RS/RG) series. These points in Wyoming are commonly found in prehistoric sites in the southwestern, south-central, central, west-central and northwestern portions of the state, often co-occurring with Fremont ceramics.

Dating of RS/RG components suggests the beginnings of bow and arrow technology in southwestern Wyoming occurring about 1800+ years before present. The technology most probably spread from the core area in southwestern Wyoming into the basins to the east and north.

Several of the sites with dates from 1800+ to about 1200 B.P. contained both RS/RG arrow points and CND points within the same component (Table 5). The transition from dart to arrow likely began as a process of relatively slow adoption of the bow and arrow but eventually led to the widespread use of this technology. Even so, it appears CND points persisted (in relatively low numbers) until about 1200 B.P. based on the Wyoming data as well as for northwestern Colorado (Mullen 2018). Similar trends have been reported from the eastern Plains (Tarabek 2012), Canadian Plains (Walde 2014), Great Basin (Geib 1996), Columbia Plateau (Ames et al. 2010) and southeast (Nassaney and Pyle 1999).

The RS/RG phenomenon in Wyoming appears to be largely restricted to the intermountain basins (Green River, Great Divide, Washakie, Wind River, Wyoming, Big Horn). Few RS/RG points have been documented in the mountain ranges of western and central Wyoming. It does appear the RS/RG phenomenon is largely an intermountain basin adaptation with transhumance largely within the basins. Creasman and Thompson (1997) have posited a seasonal round from basin interiors to mountain foothills during the Uinta Phase (Late Prehistoric) covering the time span discussed here. Reliance was on floral resources, especially seeds from weedy plants such as the Cheno-ams. Both large and small game animals were exploited largely on an ad-hoc basis. Research on southwestern Wyoming sites

Table 5: Rose Spring/Rosegate Components with Corner-notched Dart Points.

Site	Location WY	Radiocarbon dates B.P.	Reference
FR4426	Central	1720+/-40, 1810+/-70	McNees et al. 2005
LN373, Area A, O12	Southwest	1640+/-60	Wheeler et al. 1986a
LN373, Area C	Southwest	1620+/-70	Wheeler et al. 1986a
LN1296, C2	Southwest	1390+/-90, 1590+/-70	Wheeler et al. 1986a
LN1296, C3	Southwest	1460+/-80, 1490+/-100, 1710+/-50	Wheeler et al. 1986a
LN2068, AU-A1	Southwest	1170+/-100	McKibben 1995
LN2068, AU-B1	Southwest	1420+/-90	McKibben 1995
LN2068, AU-B2	Southwest	1880+/-130	McKibben 1995
SW390	Southwest	1270+/-60, 1410+/-80	Rood et al. 1992
SW1080, C4	Southwest	1370+/-50	Reust 1989
SW5057, C2	South-central	1420+/-50, 1480+/-60	Harrell 1987
SW8842	Southwest	1740+/-100	Pool 2001

from this period (Smith 1988) has expanded the discussion of weedy, seedy plant exploitation and suggested intensive gathering and processing with the probability surpluses were collected and stored for winter use. Smith (1988) also suggests the possibility Uinta Phase groups intentionally encouraged the growth of seed-bearing plants including the Cheno-ams, resulting in more or less predictable locations for later collection.

There also appears to be a different kind of corner-notched arrow point (called Woodland here) which is shorter, has a wider base and is often asymmetrical compared to points in the RS/RG series. These points are usually found in the southeastern and east-central potions of Wyoming with a few examples recorded from the south-central, central, north-central and northeastern portions of the state. They sometimes co-occur with cord-marked (Woodland) ceramics.

Over time, there appears to be movement of RS/RG points east across the southern Wyoming basins (and north into the Bighorn Basin) and movement of Woodland points west and north probably from north-central and northeastern Colorado and possibly west from the central Plains across eastern Wyoming. In the period from about 1200-800 B.P., these two traditions may have come into contact in south-central Wyoming.

Based on the distribution of these points and their associated ceramics, there appears to be a transition area in roughly the central portion of the state. That is, there are far fewer RS/RG or no points (and no Fremont ceramics) east of this "boundary" and far fewer or no Woodland points (and no Woodland ceramics) west of the transition area. A similar conclusion was reached by Francis (2001) with regard to rock art styles in Wyoming. West of the Bighorn River in north-central Wyoming, the rock art is typical of Great Basin styles and east of the river the rock art is typical of Plains styles.

Two sites with human remains have been excavated in this transition area, both with RS/RG points embedded in bone. This is suggestive of conflict between the Great Basin oriented groups (RS/RG) and Plains oriented groups, although we do not know with certainty if the victims of the conflict are necessarily part of the Woodland (or other) tradition.

On the other hand, contact may also have been cooperative (or at least not openly hostile) at times, during which interaction resulted in exchange of material culture and ideas. This possibility is suggested at the Garrett Allen (Elk Mountain) site in east-central Carbon County. Sources of lithic raw materials from western and eastern sources in Wyoming and sources from northern Colorado are present together in all the depth increments spanning

over 3000 years of prehistory (Eckles and Guinard 2015; Eckles and Miller 2019). While no well-defined cultural components could be established, RS/RG and Woodland points were found at roughly the same depths, suggesting (possibly) contact (and exchange?) between the two traditions.

The Late Prehistoric period in Wyoming is marked by the adoption of bow and arrow technology, but the styles of arrow projectile points are variable within the state. There are several traditions which appear to be geographically restricted. Not discussed in this article are other arrow points styles which occurred within the RS/RG time range, namely corner-notched Avonlea and Avonlea-like points such as at the Beehive (Hall 1998), Wortham Shelter (Greer 1978) and Irvine (Duguid 1971) sites and the side-notched Wardell site arrow points (Frison 1973). Dates from these sites range from about 1400 to about 1000 B.P. These traditions are generally rare in Wyoming and may indicate movement of people into Wyoming. Clearly, the Late Prehistoric was a time of both technological and societal change in which several cultural traditions came into contact.

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Appendix A: Excavated sites in Wyoming with Rose Spring/Rosegate diagnostics, various counties (key to abbreviations at end).

Site Number	Location WY	Radiocarbon Dates	Variants present	Reference
CR301*	South-central	ca. 920+/-110	A	Eckles 2013
CR332, F. B	South-central	1260+/-40	A	Davis and Murray 2008
CR997, Str 1	South-central	1060+/-100 1140+/-110	C	Moe and Todd 1982
CR997, Str 2	South-central	1370+/-110	A	Moe and Todd 1982
CR2521	South-central	1110+/-50	A	McGuire et al. 1984
CR2653	South-central	1480+/-60	A	McGuire et al. 1984
CR3595	South-central	Not dated	A, B	Gill 2010
CR4114	South-central	1190+/-60 1440+/-90	A, B	Bower et al. 1986
CR9597, C.B	South-central	1220+/-40 to 1310+/-30	A, B	Murray 2015
FR3123	Central	1210+/-70 1220+/-50	A	Walker 2004
FR3244	Central	1210+/-60	A	Goss and Davis 2001
FR4426**	Central	1720+/-40 1810+/-70	A	McNees et al. 2005

PA201	Northwest	1230+/-110	A, B, C	Husted and Edgar 2002
Park County (burial)	Northwest	Not dated	A	Weatherman n.d.
SU1042	West-central	1050+/-50 1200+/-60 1300+/-70	B	Hoefer 1991
SU3871	West-central	1150+/-40	B	Hill and Wolfe 2016 Wolfe 2014
UT35	Southwest	1350+/-60	A, C and C(EST-SF)	Zier 1982
UT199 North Block	Southwest	1320+/-60 1420+/-80 1490+/-60	A, C(EG)	Schroedl 1985
UT199 South Block	Southwest	930+/-70	C	Batterman and Smith (1989) Smith (1992)
UT390	Southwest	1160+/-50 1250+/-60	A, C	Schroedl 1985
UT779	Southwest	1130+/-80	C	Schroedl 1985
UT920	Southwest	1650+/-60	A, C(EST)	Latady 1989
UT1984, Upper Comp.	Southwest	1210+/-70 1260+/-60	A	Adams et al. 2011
UT1984, Lower Comp.	Southwest	1710+/-70	A, C(EST)	Adams et al. 2011
UT2010	Southwest	1450+/-50	B	Brechtel 1999
LN127	Southwest	1280+/-85	A, C	Schock et al. 1983

* RS/RG in mixed deposits with other diagnostics.
**RS/RG co-occur with CND in component

Appendix B: Excavated Sites with Rose Spring/Rosegate Diagnostics, Lincoln and Sweetwater Counties.

Site	Location WY	Radiocarbon Dates	Variants present	Reference
LN176	Southwest	1170+/-60	A, B	Bruder and Rhodes 1993
LN373, Area A, O13	Southwest	1030+/-80	A, C	Wheeler et al. 1986a
LN373, Area A, O12	Southwest	1170+/-60	A, C and C(EG)	Wheeler et al. 1986a
LN373, Area A O14**	Southwest	1640+/-60	A, C	Wheeler et al. 1986a
LN373 Area C**	Southwest	1620+/-70	A, C	Wheeler et al. 1986a
LN373, Area D	Southwest	1460+/-65	B	Wheeler et al. 1986a
LN1185	Southwest	1320+/-80	C	McDonald 1993
LN1296, C2**	Southwest	1390+/-90 1590+/-70	A	Wheeler et al. 1986b
LN1296, C3**	Southwest	1460+/-80 1490+/-100 1710+/-50	A, B, C(EST)	Wheeler et al. 1986b

LN1296, C4	Southwest	980+/-70	A, C	Wheeler et al. 1986b
LN1301	Southwest	1070+/-30 1220+/-30	A, C	Scott 2015
LN1334	Southwest	1580+/-80	C(EST)	Wheeler et al. 1986a
LN1468, C7	Southwest	960+/-60	A, C	Smith and Creasman 1987
LN1468, C6	Southwest	1170+/-60	A, C	Smith and Creasman 1987
LN1468, C5	Southwest	1310+/-70	A, C	Smith and Creasman 1987
LN1468, C4	Southwest	1500+/-70	A, B	Smith and Creasman 1987
LN1733	Southwest	1250+/-90	B	Hoefer and Darlington 1991
LN2068, AU-B3	Southwest	1150+/-100	B, C	McKibben 1995
LN2068, AU-A1**	Southwest	1170+/-100	A	McKibben 1995
LN2068, AU-B1**	Southwest	1420+/-90	A, B	McKibben 1995
LN2068, AU-B2**	Southwest	1880+/-130	C	McKibben 1995
LN3997, AU3	Southwest	1180+/-40 1220+/-30 1230+/-30 1320+/-60 1350+/-60	A, B, C and C(EG)	Williams et al. 2013 Nelson 2015
SW212	Southwest	1470+/-100	A, B, C	Metcalf 1975
SW270	Southwest	1210+/-60 1400+/-80 1460+/-90	A, B, C	McNees et al. 1992a

*RS/RG points present with other diagnostics in mixed deposits.
** RS/RG co-occur with CND in component

Appendix C: Excavated Sites in Wyoming with Rose Spring/Rosegate Diagnostics, Sweetwater County.

Site	Location WY	Radiocarbon Dates	Variants present	Reference
SW390 A, F1	Southwest	1270+/-80	A	Burns 1988
SW390**	Southwest	1270+/-60 1410+/-80	A	Rood et al. 1992
SW550, C2	South-central	1660+/-80 1420+/-40	A	Darlington et al. 2004
SW871, F2	South-central	1050+/-100	A	Pinner and Larson 1977
SW883	South-central	1430+/-50 1840+/-70	A	Davis 2008
SW1080, C4**	Southwest	1370+/-50	A	Reust 1989
SW1090	Southwest	1140+/-70 to 1370+/-40	A	Lubinski 2003 Darlington et al. 2004
SW1708	Southwest	1160+/-50 1290+/-80	C	Metcalf and Anderson 1982

SW5057, C3	South-central	1250+/-60 to 1300+/-100	A	Harrell 1987
SW5057, C2**	South-central	1420+/-50 1480+/-60	A, B	Harrell 1987
SW5215	Southwest	1090+/-60	B	McKern 1987
SW5222, North #2	Southwest	850+/-60	A	Hakiel et al. 1985
SW5377	Southwest	980+/-90 1210+/-60	C	Harrison 1986
SW5649, CB	Southwest	1400+/-70	A	McKibben et al. 1989
SW5649, CA	Southwest	1520+/-60	A	McKibben et al. 1989
SW5655	Southwest	1730+/70	B, C(EG)	McKibben et al. 1989
SW5800	Southwest	1290+/-70	A, C	Reust et al. 1984
SW6253	South-central	1630+/-70	C(EST)	Swenson 1986
SW6324, CE4	South-central	1270+/-80	C	McNees et al. 1992b
SW6324, CW2	South-central	1010+/-50	A, C	McNees et al. 1992b
SW6454, O1	Southwest	1010+/-60	A	Kautzman 2000
SW6454, O2	Southwest	1270+/-70	A, C	Kautzman 2000
SW6926, C3	Southwest	1420+/-90	A, C and C(EG)	Darlington and Hoefer 1992
SW7101	South-central	1060+/-90	C	Shields et al. 1989
SW7107	South-central	1110+/-70 1460+/-70	A	Reust et al. 1992
SW7991, C2*	South-central	1220+/-60 1360+/-60 1640+/-80 1740+/-80	A, C, and C(EST)	McNees et al. 1992b

*RS points present with other diagnostics in overlapping occupations.
** RS/RG co-occur with CND in component

Appendix D: Excavated Sites in Wyoming with Rose Spring/Rosegate Diagnostics, Sweetwater County.

Site	Location WY	Radiocarbon Dates	Variants present	Reference
SW7678	Southwest	1580+/-80	C	Thompson et al. 1988
SW8842**	Southwest	1740+/-100	A	Pool 2001
SW9251, C3	Southwest	1530+/-90	A	Murray 2000
SW10233	Southwest	1190+/-70	A	Johnson 2000
SW10888, C3-O3	Southwest	950+/-80	A, B	Stainbrook 2000
SW10888, C3-O5	Southwest	950+/-90	A, B	Stainbrook 2000
SW10888, C3-O6	Southwest	1020+/-60	A	Stainbrook 2000
SW10893, C1	Southwest	1450+/-60 1750+/-60	C, and C(EG)	Darlington 2000

SW11902	Southwest	1190+/-60	A	Roufs 2005
SW12174	South-central	1160+/-50	A	Darlington 2004
SW12352	South-central	1250+/-60	A	Lubinski 2000
SW13490, C1	Southwest	810+/-60 970+/-60 1180+/-60	A	Buenger et al. 2007
SW13490, C2	Southwest	820+/-70 910+/-40 1180+/-60	A	Buenger et al. 2007
SW13552, C1-O3	Southwest	1490+/-60 1620+/-50	A, C	Buenger et al. 2007
SW13992*	Southwest	1260+/-60	A	Buenger et al. 2007
SW16684	Southwest	1120+/-30 1130+/-40	B	Darlington 2015
SW17760	Southwest	1230+/-30 to 1440+/-40	A	Kautzman 2017
SW18090	Southwest	1050+/-30	A	Waitkus 2012

*RS points present with other diagnostics (mixed deposits?).
** RS/RG co-occur with CND in componentKey:

AU=Analytical unit
C=Component
CND=Corner-notched dart
Comp.=component
EG=Eastgate
EST=”early stemmed”
F=Feature
O=Occupation
SF=Surface
Str=Stratum

Appendix E: Sites with Fremont Ceramics in Wyoming.

Site	Location in WY	Context	Co-occur with Rose Spring/ Rosegate points	Reference
CR4114	South-central	Dated component	Yes	Bower et al. 1986
LN22	Southwest	Surface		Site form
LN346	Southwest	Surface	Yes	Site form
LN919	Southwest	Undated component	Yes	Hoefer and Schoen 1985
LN1296	Southwest	Dated component	Yes	Wheeler et al. 1986b
LN3040	Southwest	Surface		Site form
LN3117	Southwest	Surface		Site form
SU1087	Southwest	Surface		Mackey et al. 1989
SU1879	Southwest	Surface		Site form
SU2508	Southwest	Surface		Site form
SU3871	Southwest	Surface	Yes	Wolfe 2014

SW30	Southwest	Surface		Batterman and Smith 1989
SW44	Southwest	Surface		Batterman and Smith 1989
SW88	Southwest	Surface		Batterman and Smith 1989
SW94	Southwest	Surface		Smith1992
SW97	Southwest	Dated component		Smith 1992
SW101	Southwest	Surface	Yes	Batterman and Smith 1989
SW155	Southwest	Dared component		Batterman and Smith 1989
SW1433	Southwest	Dated component		Batterman and Smith 1989
SW2327	Southwest	Surface		Batterman and Smith 1989
SW2942	South-central	Surface		Smith 1992
SW3036	Southwest	Surface		Smith 1992
SW4560	Southwest	Surface		Batterman and Smith 1989
SW4643	Southwest	Surface	Yes	Batterman and Smith 1989
SW4689	Southwest	Surface		Batterman and Smith 1989
SW5222	Southwest	Dated components	Yes	Hakiel et al. 1985, 1987
SW5377	Southwest	Surface	Yes	Smith 1992
SW6191	Southwest	Dated component	Yes	Truesdale and Eckerle 1986
SW6454	Southwest	Dated component	Yes	Kautzman 2000
SW7107	South-central	Dated component	Yes	Greer and Greer 1989
SW7672	Southwest	Surface		Site form
SW7951	South-central	Surface		Site form
SW9376	South-central	Surface	Yes	Site form
SW10233	Southwest	Dated component	Yes	Johnson 2000
SW10242	Southwest	Surface	Yes	Site form
SW14071	Southwest	Surface		Site form
SW14775	South-central	Surface	Yes	Site form
SW14892	Southwest	Surface	Yes	Site form
SW15694	Southwest	Surface		Site form
SW16000	South-central	Surface		Site form
SW16761	Southwest	Surface		Site form
SW17185	Southwest	Surface		Site form
SW18479	Southwest	Surface		Site form
UT199	Southwest	Dated component	Yes	Batterman and Smith 1989
UT920	Southwest	Dated component	Yes	Latady 1989
UT967	Southwest	Surface	Yes	Site form

Appendix F: Sites with Cord-marked Ceramics in Wyoming.

Site	Location in WY	Context	Co-occur w/ BSNT Pt	Co-occur w/ WD Pt	Reference
AB301	Southeast	Surface		Yes	Zeimens 1975
AB302	Southeast	Undated component		Yes	Reher 1971
AB305	Southeast	Undated component		Yes	Gebhard et al. 1984
AB1137	Southeast	Surface			Site form
CA1998	Northeast	Surface			Site form
CA4475	Northeast	Surface	Yes		Site form
CA4787	Northeast	Surface			Site form
CA6865	Northeast	Surface	Yes		Site form
CA7008	Northeast	Surface			Site form
CK204	Northeast	Undated component			Wheeler 1996
CO3450	East-central	Surface			Site form
CR123	South-central	Dated component		Yes	McGuire and Joyner 1981
CR301	South-central	Dated deposits	Yes	Yes	Eckles 2013
CR325	South-central	Dated component	Yes		Reher 1987
CR6524	South-central	Surface	Yes	Yes	Site form
GO51	Southeast	Surface		Yes	Site form
GO54	Southeast	Dated component			Korell 1989
GO302	Southeast	Surface		Yes	Reher 1971
GO303	Southeast	Surface			Reher 1971
GO305	Southeast	Undated component			Zeimens et al. 1995
JO938	North-central	Dated component	Yes		Bower et al. 1991
LA277	Southeast	Surface			Site form
LA303	Southeast	Dated component	Yes	Yes	Reher 1971
LA304	Southeast	Dated component		Yes	Reher 1971
LA305	Southeast	Undated component		Yes	Reher 1971
LA306	Southeast	Surface			Reher 1971
LA307	Southeast	Surface			Reher 1971
LA310	Southeast	Surface			Reher 1971
LA311	Southeast	Undated component		Yes	Reher 1971
LA312	Southeast	Dated component		Yes	Reher 1971
LA313	Southeast	Surface			Reher 1971
LA319	Southeast	Surface			Reher 1971
LA320	Southeast	Surface			Reher 1971
LA325	Southeast	Dated component		Yes	Frison 1991
LA534	Southeast	Surface			Site form
NA83	Central	Dated component	Yes		Eckles et al. 2012
NA157	Central	Surface	Yes	Yes	Reiss et al. 1985

NA182	East-central	Surface	Yes	Yes	Goss and Slensker (2002)
NA543	East-central	Surface			Site form
NA999	East-central	Surface			Site form
NA1000	East-central	Dated component	Yes		Miller and Waitkus 1989
NA3502	East-central	Surface			Site form
PL65	Southeast	Dated component	Yes		Tibesar (1980)
PL249	Southeast	Surface			Site form
PL487	Southeast	Surface			Site form
PL709	Southeast	Dated component		Yes	Zeimens et al. 1992

BSNT=Besant, WD=Woodland

MORPHOLOGICAL VARIATION BETWEEN THE SWIFT FOX (*Vulpes velox)* AND THE RED FOX (*Vulpes vulpes)* PELVIS AND FEMUR

by
Robert Ficenec

ABSTRACT

Two species of fox, *Vulpes velox* and *Vulpes vulpes* have frequently been found co-existing in the same and different environments although normally found in separate habitats. Confusion in the identification of these species of *Vulpes* may result from the remains of both species being found in the same archaeological site. In this study, modern specimens were examined to determine metric and morphological variations between these two species of *Vulpes* which would allow for their identification from the pelvis and femur.

INTRODUCTION

Investigations of archaeological sites can often result in recovery of small canid remains, tentatively classified as *Vulpes* spp. Although these remains can be easily identified as canid remains from written descriptions and illustrations, they are not easily identified to species because of morphological similarities between the post-cranial elements. This process becomes exceedingly difficult when attempts are made to identify species whose bones are similar in shape; such as the various species of *Vulpes*.

The swift fox, *Vulpes velox*, and the red fox, *Vulpes vulpes*, are classified as separate species, and are frequently seen inhabiting the same environments. The red fox, *V. vulpes*, is one of the most widely distributed carnivores in the world, occurring throughout most of North America, Europe, Asia and parts of northern Africa and Australia (Voigt 1987:380).

The swift fox, *V. velox*, was once common in areas of the North American prairie, with its range extending from the Canadian prairie in the north, southwards across Montana, eastern Wyoming, the Dakotas, Nebraska, Kansas and Colorado through to northwestern Texas, the Oklahoma panhandle and eastern New Mexico (Scott-Brown et al. 1987:433; Stromberg and Boyce 1986:100). There is a large overlap in the geographic ranges of these two species of *Vulpes*, primarily in the past, but also in their present distributions (Figure 1). This allows for the

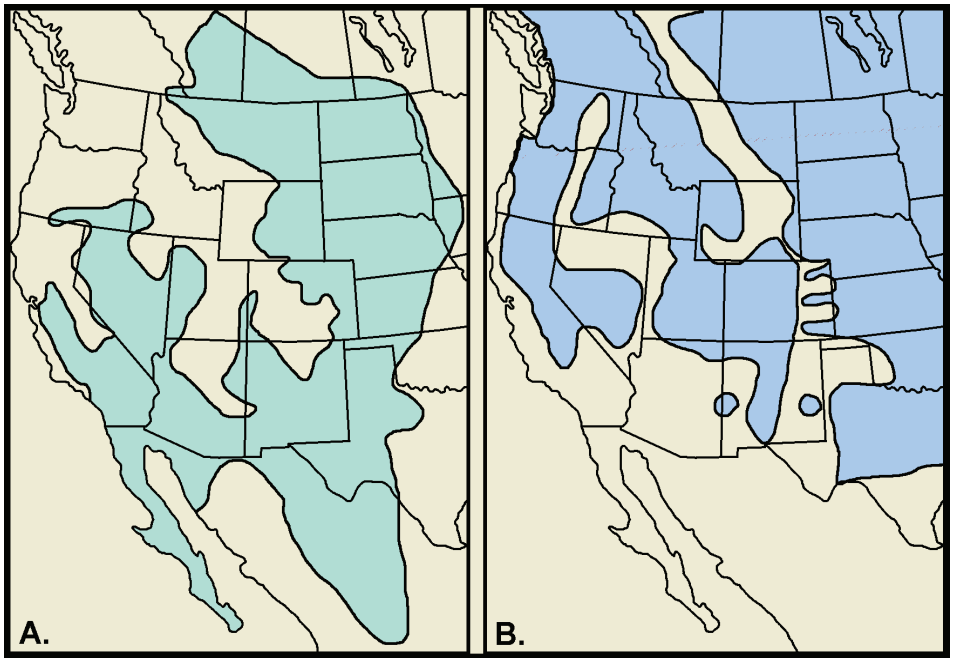

Figure 1: Map of western North America show range distribution of (A) swift and (B) red fox.

possibility of either or both of these species to occur in a wide variety of archaeological sites in a major portion of North America. Because of this, there has been a need for a system of measurements which will allow for the identification between these two species of North American *Vulpes*.

Generally, the primary skeletal element used for identification of canids has been cranial elements (Gilbert 1983:41; Scott-Brown et al. 1987:437-438; Stromberg and Boyce 1986:133; Voigt 1987:383). However, since cranial elements are not always found in an archaeological site in primary association with canid post-cranial elements, a need has developed for further research into the identification of post-cranial remains to distinguish between the species of *Vulpes*. This can be accomplished by examining size variation through a systematic set of measurements.

The objective of this paper is to develop a set of metric measurements that will allow identification of archaeological remains of *V. velox* and *V. vulpes* consistently and accurately without use of a comparative collection. These measurements should reflect not only size variation between the two species, but may also show sex differences within a species and any morphological variations which might be present.

METHODS

Twenty-two adult *V. velox* and thirteen adult *V. vulpes* specimens were selected from the University of Wyoming Department of Anthropology Comparative Osteology Museum Collection for the measurement of nine pelvic and six femur characteristics, as described by Driesch (1978:82-85). These measurements, developed for use in the description of faunal remains from archaeological sites, are easily adapted for use in the description and analysis of modern comparative collections.

In this study, all measurements were taken using a Fowler electronic digital caliper. Of the measurements described by Driesch, nine pelvic measurements were used of the twelve described, and six of the eight measurements described for the femur. These specific measurements were selected for this study because I felt they were more diagnostic, and would preserve better on archaeological remains than the other measurements defined by Driesch.

As a result of the small sample sizes, I felt it was necessary to include elements which were not completely fused. The complete series of measurements were not used on the younger animals, however many of the measurements could still be included in the sample. These individuals were also examined for any morphological variations in shape occurring between these two species of V*ulpes*.

RESULTS

Bivariate scatter-plots and discriminant analysis of the pelvis and femur measurements were produced to determine a metric method which would allow for identification of sexes and to distinguish between species of *Vulpes*. In the following section, I will discuss the results of the analysis.

SPECIES SEPARATION

In general morphology, there are no significant differences in shape between the *V. velox* and *V. vulpes* femora other than size. The pelves of these species of *Vulpes* display characteristics which are diagnostic for both of the species. The lateral angle of the tubera coxarum in the *V. velox* pelvis is about thirty degrees greater than that of the *V. vulpes* pelvis. This can be seen when the pelvis is either held so that you are looking directly down the shaft of the ilium from the anterior side (Figure 2), or placed flat on a level surface and looked at from the proximal side (Figure 3).

Because of the significant variation in size between *V. velox* and *V. vulpes*, they can easily be identified from size alone. In all of the measurements, *V. vulpes* was larger than *V. velox* except for the greatest breadth across the tubera coxarum in which *V. velox* was 4.6 percent larger

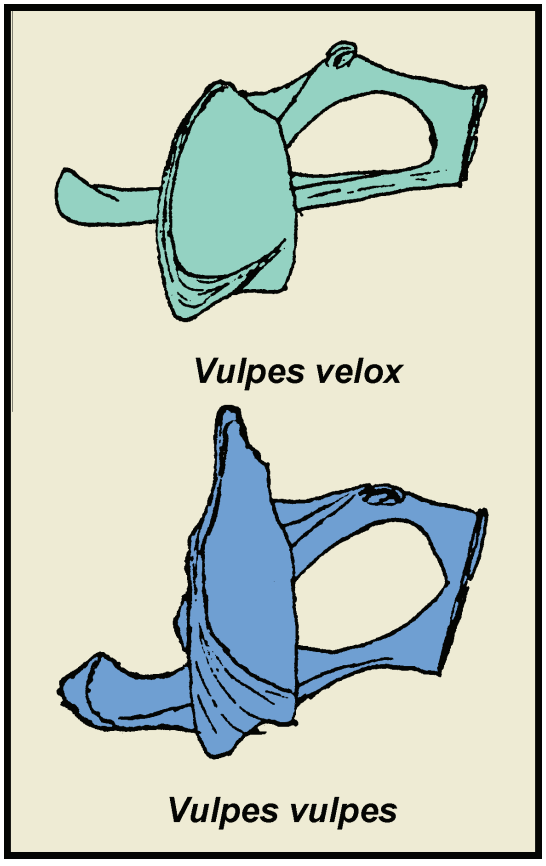

Figure 2: Posterior (caudal) view of fox innominates, showing morphological differences between V. velox and V. vulpes.

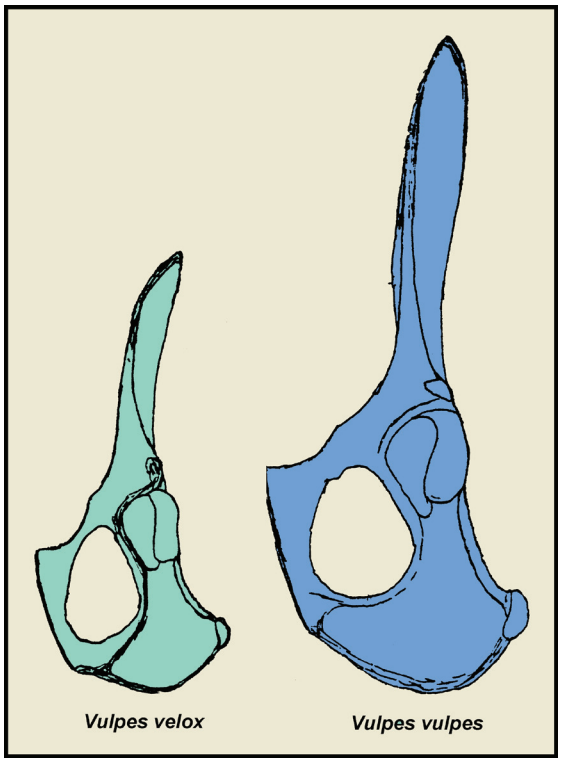

Figure 3: Posterior (caudal) view of fox innominates, showing morphological differences between V. velox and V. vulpes.

(Figure 4). *V. vulpes* femora ranged from 19.4 percent larger for the breadth of the proximal end to 29.6 percent larger for the greatest length. For the pelvis, *V. vulpes* ranged from 13.7 percent larger for the inner length of the foramen obturatum to 27.6 percent larger for the breadth of the ilium shaft.

V. velox can be distinguished from other North American vulpines except the kit fox, *Vulpes macrotis*, by its small size (Egoscue 1979:1). The size variation between the two species of *Vulpes* under consideration here is great enough so there is almost no overlap in any of the measurements of the elements except the length of the foramen obturatum and the breadth of the tubera coxarum (Figure 4). This may be the result of the smaller size of *V. velox* and its reduced capabilities for speed (Egoscue 1979:2).

The bivariate scatter-plots of the measurements on the pelvis and femur of *V. velox* and *V. vulpes* demonstrated a clear species separation (Figures 4-8). All measurements of the femur are larger for *V. vulpes* than they are for *V. velox*. The length of the *foramen obturatum* has some overlap with a few measurements between the two species of *Vulpes* under consideration in this study, but this however, is insignificant because *V. velox* could still separated from *V. vulpes* when the measurements are placed in a bivariate scatter-plot in comparison to the greatest length (Figure 6). Another measurement in which there is some overlap is the greatest breadth of the *tubera coxarum* (Figure 4). In this measurement, there is a significant overlap between the measurements, but *V. velox* averages 4.6 percent larger than the same measurement in the *V. vulpes* pelvis.

DISCUSSION

All measurements of the femur and pelvis used in this study can be used to separate between *V. velox* and *V. vulpes*. The largest difference between the two species of *Vulpes* was the size. In all of the measurements except one, the mean values are larger for *V. vulpes*, reflecting the greater size of this species.

As mentioned earlier, the greatest breadth across the *tubera coxarum* is greater in *V. velox* as a result of the flaring of the lateral angle of the *tubera coxarum*. This appears to be the best way to distinguish between *Vulpes* sp. pelvis visually.

Metrically, it seems that the best way to distinguish between the species is by the use of the descriptive statistics (Tables 5-8), and the mean and range of the variables If a series of measurements fall within the range of the comparative collection, there is a high probability the identification of the unknown specimen will be the same as that of the modern specimen. However, other species of *Vulpes* were not considered and must be considered, especially in eastern North America.

Many of these differences are the result of a slight variation in the proportions of the variable. This is enough to create clusters in the bivariate scatter-plots which will separate out the species fairly consistently.

CONCLUSIONS

Not only should other species of *Vulpes* be considered, but also different elements and measurements which might better distinguish between the sexes. Since these animals are different species, many of the elements

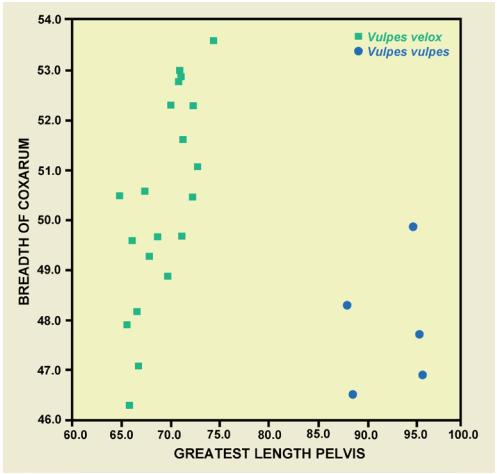

Figure 4: Bivariate plot showing size difference between *V. velox* and *V. vulpes* innominates.

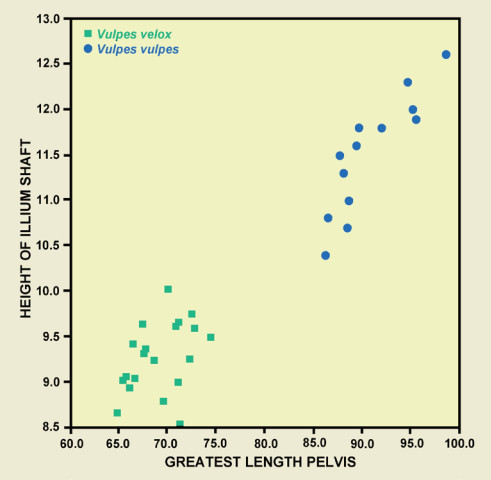

Figure 5: Bivariate plot showing size difference between *V. velox* and *V. vulpes* innominates.

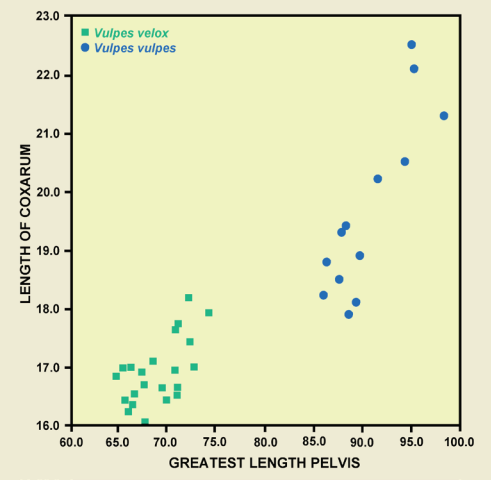

Figure 6: Bivariate plot showing size difference between *V. velox* and *V. vulpes* innominates.

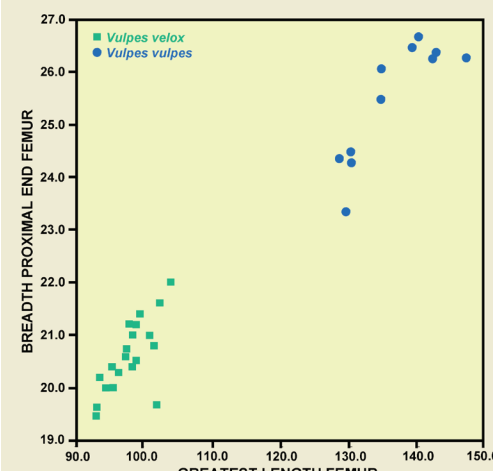

Figure 7: Bivariate plot showing size difference between *V. velox* and *V. vulpes* femora.

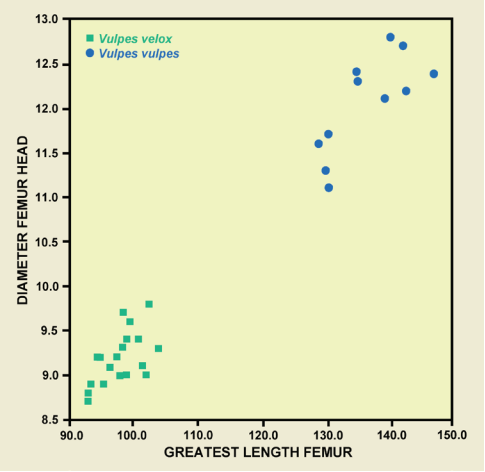

Figure 8: Bivariate plot showing size difference between *V. velox* and *V. vulpes* femora

should display some distinctive features which will allow for identification, but work has to be done to determine what they are. As a result of the many different species of *Vulpes*, a comparative collection should still be used if one is available; but if not, the investigator will have to rely on descriptions and metric data.

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