

Department of Rangeland, Wildlife and Fisheries Management - Texas A&M University, College Station, TX

▼ty.werdel@ag.tamu.edu | ☆ werdelwildlife.com | ②tywerdel | ☐ tywerdel | Уtywerdel

My research interests include the fields of Wildlife Management and Landscape Ecology. This work addresses questions that provide insight into the relationships between wildlife, native environments, and contemporary human-modified landscapes. I am also interested in software programming to advance my professional acumen, with this CV being compiled with code.

### Education

Ph.D. Horticulture and Natural Resources Manhattan, KS KANSAS STATE UNIVERSITY 2022 M.S. Wildlife Sciences Brookings, SD SOUTH DAKOTA STATE UNIVERSITY 2017 B.S. Rangeland and Wildlife Management Chadron, NE CHADRON STATE COLLEGE 2013

### Certifications

**Esri Academy ArcGIS (9 Certifications)** Online **ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE** 2021 Professional Certification in Data Analysis for Life Sciences (R) Online HARVARDX, HARVARD UNIVERSITY 2020 **GTA Certificate of Achievement in Professional Development** Manhattan, KS KANSAS STATE UNIVERSITY 2020 **Faculty Exchange for Teaching Excellence** Manhattan, KS KANSAS STATE UNIVERSITY 2020 **Associate Wildlife Biologist®** Online THE WILDLIFE SOCIETY 2016 **Graduate Certification in Geospatial Technology** Rapid City, SD SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY 2016 **Project WILD/Project WILD Aquatic** Chadron, NE ASSOCIATION OF FISH AND WILDLIFE AGENCIES 2013

# **Employment**\_

**Assistant Professor** 

DEPARTMENT OF RANGELAND, WILDLIFE, AND FISHERIES MANAGEMENT, TEXAS A&M UNIVERSITY	2023 – Present
Vice Chancellor's Postdoctoral Research Fellow	College Station, TX
Department of Rangeland, Wildlife, and Fisheries Management, Texas A&M University	2022 - 2023
Graduate Research and Teaching Assistant	Manhattan, KS
DEPARTMENT OF HORTICULTURE AND NATURAL RESOURCES, KANSAS STATE UNIVERSITY	2017 – 2022
Graduate Research and Teaching Assistant	Brookings, SD
Department of Natural Resource Management, South Dakota State University	2014 – 2017
GIS Technician	Scottsbluff, NE
North Platte Natural Resources District	2014 – 2014
Undergraduate Researcher	Socorro, NM
Sevilleta LTER Research Experience	2013 - 2013

College Station, TX

#### **Construction Foreman**

WERDEL STEEL CONSTRUCTION

**Construction Laborer** 

WERDEL STEEL CONSTRUCTION

Chadron, NE 2005 – 2013

Chadron, NE 1998 – 2005

### **Publications**

#### Peer-Reviewed

- 8. **Werdel, T.J.**, C.W. Piper, A.M. Ricketts, M.S. Peek, and A.A Ahlers. **2023**. Direct and indirect landscape-scale pathways structure carnivore communities in an agro-prairie ecosystem. *Journal of Mammalogy*. https://doi.org/10.1093/jmammal/gyad065
- 7. Werdel, T.J., J.A. Jenks, J.T. Kanta, C.P. Lehman, and T.J. Frink. 2023. Resource selection and herbaceous biomass at foraging sites of translocated bighorn sheep. *Rangeland Ecology and Management*. https://doi.org/10.1016/j.rama.2022.12.004
- 6. **Werdel, T.J.**, C.W. Piper, A.M. Ricketts, M.S. Peek, D.S. Sullins, and A.A Ahlers. **2023**. Strategic grassland conservation for swift foxes in multi-use landscapes. *Biological Conservation*. https://doi.org/10.1016/j.biocon.2022.109864
- 5. Palomo-Muñoz, G, **T.J. Werdel**, C.W. Piper, M.S. Peek, A.M. Ricketts, and A.A Ahlers. **2022**. Spatiotemporal distributions of mammals occurring in an agro-prairie ecosystem. *Ecology*. https://doi.org/10.1002/ecy.3945
- Werdel, T.J., C.W. Piper, A.M. Ricketts, M.S. Peek, and A.A. Ahlers. 2022. Scale-specific landscape effects impose range-limiting constraints on the distribution of swift fox. Landscape Ecology, 37(8), 2065–2079. https://doi.org/10.1007/s10980-022-01466-0
- 3. **Werdel, T.J.**, J.A. Jenks, J.T. Kanta, C.P. Lehman, and T.J. Frink. **2021**. Space use and movement patterns of translocated bighorn sheep. *Mammalian Biology*, 101(3),329–344. https://doi.org/10.1007/s42991-021-00107-4
- Werdel, T.J., J.A. Jenks, T.E. Besser, J.T. Kanta, C.P. Lehman, and T.J. Frink. 2019. Restoration of a bighorn sheep population impeded by Mycoplasma ovipneumoniae exposure. Restoration Ecology, 28(2), 387–395 (Cover Article). https://doi.org/https://doi.org/10.1111/rec.13084
- Werdel, T.J., J.A. Jenks, T.E. Besser, J.T. Kanta, C.P. Lehman, and T.J. Frink. 2018. Survival of translocated bighorn sheep in the Deadwood region of the Black Hills, South Dakota. Northwestern Naturalist, 99(3),222–231. https://doi.org/10.1898/ NWN18-06.1

#### **Book Chapters**

1. Hessami, M.A., **T.J. Werdel**, S.J. Hoagland, and M.T. Kohl. **2022**. Melding Past, Present, and Future: The importance of tribal management in wildlife conservation and management. Chapter 1 in C. Bishop, E. Gomez, J. Organ, and T. Ryder eds. *Introduction to Wildlife Management and Conservation in North America*. Great River Learning of Dubuque, IA.

#### **Book Reviews**

1. **Werdel, T.J. 2023**. Wildlife Management and Landscapes: Principles and Applications. Journal of Wildlife Management *In Press*.

#### In-Revision/Review

- 2. Piper, C.W., **T.J. Werdel**, M.S. Peek, A.M. Ricketts, D.S. Sullins, and A.A. Ahlers. **In-Revision**. Landscape composition and proximity to water structure American badger distributions in shortgrass prairie. *Journal of Mammalogy*.
- 1. **Werdel, T.J.**, M. Fidino, C.W. Piper, A.M. Ricketts, M.S. Peek, and A.A Ahlers. **In-Revision**. Landscape composition mediates spatiotemporal interactions among sympatric canids in a prairie ecosystem. *Ecological Applications*.

# **Teaching Experience**

Texas A&M University College Station, TX

INSTRUCTOR

Co-Instructor

Techniques of Wildlife Management, RWFM 408 & WFSC 638

Texas A&M University

• Special Topics in Traditional Ecological Knowledge, RWFM 689

• Techniques of Wildlife Management, RWFM 408 & WFSC 638

College Station, TX

2022 - 2023

2023 - Present

**Kansas State University**Manhattan, KS

GRADUATE TEACHING ASSISTANT

2017 – 2022

• Firearms Cartridges and Ballistics, WOEM 201

- Rifle and Handgun Range Design, Construction and Operations, WOEM 202
- Introduction to Wildlife and Outdoor Enterprise Management, WOEM 250
- Flora and Fauna of the Great Plains, WOEM 350
- Big Game Management, WOEM 555
- Waterfowl and Wetlands Management, WOEM 561
- Advanced Wildlife Habitat Management, WOEM 562

### **South Dakota State University**

Brookings, SD

**GRADUATE TEACHING ASSISTANT** 

2014 - 2017

2023

Introduction to Wildlife and Fisheries, WL 220

## Student Mentorship

### Graduate Student Advising

Graduate Student Advising	
Amanda Laboy, M.S.	2023 – Present
Lulu Hoffman, M.S.	2023 – Present
Kayla Art, M.N.R.D.	2023 – Present
David Pearce, M.S.	2023 – Present
Conner Ties, M.S.	2022 – Present
Undergraduate Student Research Advising	
Daniel Whitman, R.E.U.	2023 – 2023
Drake Dancila, B.S.	2022 – 2023
Lulu Hoffman, B.S.	2022 – 2023
Student Honors & Awards	
RWFM Graduate Student Travel Grant, Conner Ties	2023
RWFM Graduate Student Travel Grant, David Pearce	2023
RWFM Excellence Award for Undergraduates, Drake Dancila	2023

## **Investigator Grants & Contracts**

Funded (Total: \$3,671,077, Lab Allocated: \$371,200)

**RWFM Excellence Award for Undergraduates**, Lulu Hoffman

- 8. **TAMU AgriLife Research Animal Health and Disease Research Capacity Funding**. 2024-2025. The impact of osmotic stress on the catfish pathogen *Aeromonas hydrophila*: Implications for managing motile *Aeromonas* septicemia (MAS) in U.S. catfish farming. **\$100,000**; *Funded*. PI: Haitham Mohammed, Co-PI: **Ty J. Werdel**.
- 7. **Private Donation**. 2023. Student-led population ecology of fox squirrels on the TAMU campus. **\$10,000**; *Funded*. PI: Ty J. Werdel
- 6. **USFWS**. 2023-2027. Evaluation and mitigation for sensitive state threatened and endangered wildlife. **\$3,399,877**; *Funded*. Co-PIs: Marcus Blum, Paul Crump, Jacob Dykes, Whitney Gann, Andrew Gregory, Toby Hibbitts, Mathew Kramm, Roel Lopez, Kevin Moczygemba, Michael Morrison, Humberto Perotto, Wady Ryberg, Danielle Walkup, Stephen Webb, and **Ty J. Werdel** (**Lab Allocated: \$200,000**).
- 5. **National Science Foundation**. 2023-2025. Incorporating Native American partnerships and knowledge into Great Plains fire science. **\$199,404**; *Not Funded*. PI: David Matarrita, Co-PIs: Bradford Wilcox and **Ty J. Werdel**.
- 4. **USDA APHIS Wildlife Services**. 2023-2024. Spatial interactions and potential disease transmission of free-ranging native and exotic ungulates. **\$225,437**; *Not Funded*. PI: **Ty J. Werdel**.
- 3. **Department of Rangeland, Wildlife and Fisheries Management**. 2023-2024. Long-term wildlife monitoring for unmanaged rangelands transitioning to planned grazing management. **\$100,000;** *Funded*. PIs: Stephen L. Webb and **Ty J. Werdel**.
- 2. **Private Donation**. 2023. Long-term wildlife monitoring for unmanaged rangelands transitioning to planned grazing management. **\$1,200**; *Funded*. Pl: **Ty J. Werdel**.
- 1. **Department of Rangeland, Wildlife and Fisheries Management**. 2023-2025. River otter (*Lontra canadensis*) population dynamics in Texas. **\$60,000**; *Funded*. PI: **Ty J. Werdel**.

## **Honors & Awards**

# Awards (\$121,150)

Community Building Through Mentorship Conference Panel Travel Grant, The Wildlife Society	2022
Agriculture Dean and Director's Award for Graduate Student Research, Kansas State University	2022
Advancing Agricultural Science Opportunities for Native Americans Scholarship, AISES	2021
Robert Nunemacher Scholarship, Kansas State University	2021
Advancing Agricultural Science Opportunities for Native Americans Research Award, AISES	2020
Advancing Agricultural Science Opportunities for Native Americans Scholarship, AISES	2020
Lighting the Pathway to Faculty Careers for Natives in STEM, AISES	2020
College of Agriculture Graduate Student Recognition of Achievement, Kansas State University	2020
AISES Together Towards Tomorrow T3 Scholarship, AISES	2020
Gamma Sigma Delta, Kansas State University	2019
AISES Travel Grant, AISES	2019
Advancing Agricultural Science Opportunities for Native Americans Scholarship, AISES	2019
Kansas State University Graduate Student Recognition of Achievement, Kansas State University	2019
College of Agriculture Graduate Student Recognition of Achievement, Kansas State University	2019
Inclusive Pedagogy Travel Grant, The Wildlife Society	2018
Life Membership Fund Scholarship, Wild Sheep Foundation	2018
Predoctoral Ford Fellowship, (Honorable Mention) Ford Foundation Fellowships Program	2018
Native Student Professional Development Grant, The Wildlife Society	2017
Launch Collegiate Business Pitch Competition, Kansas State University	2017
Native Student Professional Development Grant, The Wildlife Society	2016
Phi Kappa Phi Honor Society, South Dakota State University	2016
Excellence in Wildlife Management, Chadron State College	2013
Platinum Eagle Award, (Finalist) Chadron State College	2013
Gates Millennium Scholarship, Bill and Melinda Gates Foundation	2005
Scholastic Excellence in Engineering, University of Wyoming	2005
Scholars Stipend, University of Wyoming	2005
Computer Science, Engineering, and Mathematics Scholarship, University of Wyoming	2005
Honors Program, University of Wyoming	2005

# Professional Service \_\_\_\_\_

Executive Service in Professional Organizations

Grant Committee Native Student Professional Development Grant	The Wildlife Society 2023 – Present
Program Coordinator Native Student Professional Development Grant	The Wildlife Society 2018 – 2023
Secretary/Treasurer Central Mountains and Plains Section	The Wildife Society 2018 – 2021
Working Group Membership	
Rangeland Wildlife Working Group, The Wildlife Society Native Peoples' Wildlife Management Working Group, The Wildlife Society Student Development Working Group, The Wildlife Society	2018 – Present 2015 – Present 2013 – 2022
Chapter Membership	
Southwest Section, The Wildlife Society  Texas Chapter, The Wildlife Society  Central Mountains and Plains Section, The Wildlife Society  Kansas Chapter, The Wildlife Society  South Dakota Chapter, The Wildlife Society  Nebraska Chapter, The Wildlife Society  Chadron State Student Chapter, The Wildlife Society	2023 - Present 2023 - Present 2018 - 2022 2017 - 2022 2014 - 2017 2013 - 2014 2012 - 2013
Professional Organization Membership	
Society for Range Management Society for Advancement of Chicanos/Hispanics and Native Americans in Science Gamma Sigma Delta Honor Society American Indian Science and Engineering Society Swift Fox Conservation Team Phi Kappa Phi Honor Society Native American Fish and Wildlife Society Rocky Mountain Bighorn Society Wild Sheep Foundation American Society of Mammalogists The Wildlife Society	2023 - Present 2021 - Present 2019 - Present 2019 - Present 2018 - Present 2016 - Present 2015 - Present 2015 - 2017 2014 - 2020 2013 - Present 2013 - Present
External Journal Reviewer	
Canadian Journal of Zoology, Frontiers in Ecology and the Environment, Journal of Mammalogy, Journal of Wildlife Management, PeerJ (2), Science	
University Service	
Texas A&M University	
Faculty Advisor, TAMU Student Chapter of The Wildlife Society	2023 – Present
Department	
Caesar Kleberg Chair Search Committee, RWFM Awards Committee, RWFM Undergraduate Committee, RWFM	2023 – Present 2023 – Present 2023 – Present

### **Presentations**

### Contributed (\*WERDEL WILDLFE LAB MEMBER)

- 25. A.D. Dancila\*, **Werdel, T.J.**, S.M Chinn, J.C. Beasley, and S.L. Webb. **2023**. Analysis of reproductive parameters of wild pigs in southcentral Oklahoma. *RWFM Convocation, College Station, TX*.
- 24. M.G. Hoffman\*, M.D. Proctor, **Werdel, T.J.**, and S.L. Webb. **2023**. Activity patterns and potential interactions among cattle, white-tailed deer, and wild pigs. *RWFM Convocation, College Station, TX*.
- 23. D. Whitman\* and **Werdel, T.J.**. **2023**. Fine-scale landscape features influence fox squirrel presence on urban campus. **LAUNCH Summer Undergraduate Research Symposium, College Station, TX**.
- 22. D. Whitman\* and **Werdel, T.J.**. **2023**. Campus fox squirrel presence influenced by fine-scale landscape characteristics. **College of Agriculture and Life Sciences Summer Undergraduate Research Symposium, College Station, TX**.
- 21. M.G. Hoffman\*, **Werdel, T.J.**, M.D. Proctor, and S.L. Webb. **2023**. Activity patterns and potential interactions among cattle, white-tailed deer, and wild pigs. *Ecological Integration Symposium, College Station, TX*.
- 20. A.D. Dancila\*, **Werdel, T.J.**, S.M Chinn, J.C. Beasley, and S.L. Webb. **2023**. Analysis of reproductive parameters of wild pigs in southcentral Oklahoma. *TAMU Student Research Week*, *College Station, TX*.
- 19. M.G. Hoffman\*, M.D. Proctor, **Werdel, T.J.**, and S.L. Webb. **2023**. Activity patterns and potential interactions among cattle, white-tailed deer, and wild pigs. *TAMU Student Research Week, College Station, TX*.
- 18. **Werdel, T.J.**, C.W. Piper, A.M. Ricketts, M.S. Peek, D.S. Sullins, and A.A. Ahlers. **2023**. Strategic grassland conservation for swift foxes in multi-use landscapes. *Texas Chapter of The Wildlife Society Annual Conference, Houston, TX*.
- 17. **Werdel, T.J.**, C.W. Piper, M.S. Peek, A.M. Ricketts, and A.A. Ahlers. **2023**. Landscape-scale effects structure carnivore communities in an agro-prairie ecosystem. *Kansas Natural Resources Conference, Manhattan, KS*.
- 16. **Werdel, T.J.**, C.W. Piper, M.S. Peek, A.M. Ricketts, D.S. Sullins, and A.A. Ahlers. **2023**. Strategic grassland conservation for swift foxes in multi-use landscapes. *Kansas Natural Resources Conference, Manhattan, KS*.
- 15. Palomo-Muñoz, G., **T.J. Werdel**, C.W. Piper, M. Fidno, A.M. Ricketts, and A.A. Ahlers. **2022**. Local-scale habitat structure mediates interactions between coyotes and lagamorphs. *101st Annual Meeting of the American Society of Mammalogists, Tucson, AZ*.
- 14. **Werdel, T.J.**, C.W. Piper, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2021**. Scale-specific landscape effects impose range-limiting constraints on the distribution of swift foxes. *The Wildlife Society 28th Annual Conference, Virtual*.
- 13. Piper, C.W, **T.J. Werdel**, A.M. Ricketts, D. Sullins, M. Peek, and A.A. Ahlers. **2021**. Landscape composition and proximity to water structure American badger distributions in shortgrass prairies. *The Wildlife Society 28th Annual Conference, Virtual*.
- 12. **Werdel, T.J.**, C.W. Piper, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2021**. Multiscale landscape effects impose range-limiting constraints on the distribution of swift fox. *Swift Fox Conservation Team Meeting, Virtual*.
- 11. **Werdel, T.J.**, C.W. Piper, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2021**. Multiscale landscape effects impose range-limiting constraints on the distribution of swift fox. *Midwest Association of Fish and Wildlife Agencies Furbearer Workshop*, *Virtual*.
- 10. Piper, C.W, **T.J. Werdel**, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2021**. Landscape composition and proximity to water structure American badger (*Taxidea taxus*) distributions in shortgrass prairies. *Midwest Association of Fish and Wildlife Agencies Furbearer Workshop, Virtual*.
- 9. **Werdel, T.J.**, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2020**. Assessing factors that influence occupancy and colonization of swift fox in western Kansas. *Kansas Natural Resources Conference, Manhattan, KS*.
- 8. **Werdel, T.J.**, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2019**. Assessing factors that shape carnivore diversity in shortgrass prairie ecosystems. *American Fisheries Society and The Wildlife Society 2019 Joint Annual Conference, Reno, NV*.
- 7. **Werdel, T.J.**, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2019**. Carnivore richness and diversity is driven by landscape change in shortgrass prairie ecosystems. *99th Annual Meeting of the American Society of Mammalogists, Washington, D.C*.
- 6. **Werdel, T.J.**, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2019**. Landscape effects on swift fox occupancy in western Kansas. *Southwest/Midwest Joint Furbearer Meeting, Enid, OK*.
- 5. **Werdel, T.J.**, A.M. Ricketts, and A.A. Ahlers. **2019**. Landscape change structures carnivore communities in shortgrass prairie ecosystems. *Kansas Natural Resources Conference, Manhattan, KS*.
- 4. **Werdel, T.J.**, A.M. Ricketts, M. Peek, and A.A. Ahlers. **2018**. Assessing the spatial distribution of swift fox in western Kansas. *The Wildlife Society 25th Annual Conference, Cleveland, OH*.
- 3. **Werdel, T.J.**, J.A. Jenks. **2018**. Survival of bighorn sheep in the Deadwood region of the Black Hills. *Nebraska/Central Mountains and Plains Section of The Wildlife Society Annual Meeting, Kearney, NE*.
- 2. **Werdel, T.J.**, J.A. Jenks, J. Kanta, and C. Lehman. **2016**. Evaluation of the Deadwood bighorn sheep herd translocation. *The Wildlife Society 23rd Annual Conference, Raleigh, NC*.
- 1. Werdel, T.J.. 2013. Small mammal population and diversity in relation to prairie dog reintroduction sites. Sevilleta LTER Research Experience for Undergraduates Summer Symposium, Socorro, NM.

TEK of Wetlands Kansas State University	Manhattan, KS 2023
TEK: A Place-Based Perspective	College Station, TX
THE SACNAS DIVERSITY IN RESEARCH SYMPOSIUM	2023
Community Building Through Mentorship Panel THE WILDLIFE SOCIETY ANNUAL CONFERENCE	Spokane, WA 2022
Applied Wildlife Management: A Landscape Ecology Approach TEXAS A&M UNIVERSITY	College Station, TX 2021
Traditional Ecological Knowledge: A Place-Based Perspective TEXAS A&M UNIVERSITY	College Station, TX 2021
<b>Distribution of Swift Fox in Kansas</b> Kansas Department of Wildlife, Parks and Tourism	Emporia, KS 2021
Keynote Speaker: Youth Wildlife Conservation Experience WILD SHEEP FOUNDATION SHEEP SHOW	Reno, NV 2019
Inclusive Pedagogy Student Panel The WILDLIFE SOCIETY ANNUAL CONFERENCE	Cleveland, OH 2018
Marlatt STEM Night Marlatt Elementary School	Manhattan, KS 2018
Initiating a Student Chapter of The Wildlife Society HASKELL INDIAN NATIONS UNIVERSITY	Lawrence, KS 2018
Toyota STEM Speaker RED CLOUD INDIAN SCHOOL	Pine Ridge, SD 2016
<b>Deadwood Bighorn Sheep Translocation</b> SOUTH DAKOTA GAME, FISH, AND PARKS	Rapid City, SD 2015
<b>Bighorn Sheep and Community Interaction</b> KIWANIS CLUB	Lead, SD 2015
Graduate School Experience and Preparation CHADRON STATE COLLEGE	Chadron, NE 2015
Project WILD, Children and Wildlife RED CLOUD INDIAN SCHOOL	Pine Ridge, SD 2013
Guest Lectures	
Professional Wildlife Certification RWFM 481 - Texas A&M University	College Station, TX 2023
Occupancy Models to Study Wildlife RWFM 689 - Texas A&M University	College Station, TX 2023
Why I hunt RWFM 489 - Texas A&M University	College Station, TX 2023
Wildlife Professional Experience RWFM 305 - Texas A&M University	College Station, TX 2022
<b>Bighorn Sheep Capture and Monitoring Techniques</b> WOEM 555 - KANSAS STATE UNIVERSITY	Manhattan, KS 2022
Traditional Ecological Knowledge (TEK) of Wetlands WOEM 561 - KANSAS STATE UNIVERSITY	Manhattan, KS 2021
Bighorn Sheep Capture and Monitoring Techniques WOEM 555 - KANSAS STATE UNIVERSITY	Manhattan, KS 2021

Wild Sheep Natural History WOEM 350 - KANSAS STATE UNIVERSITY	Manhattan, KS 2021
Bighorn Sheep Capture and Monitoring Techniques WOEM 555 - KANSAS STATE UNIVERSITY	Manhattan, KS 2020
Traditional Ecological Knowledge (TEK) of Wetlands WOEM 561 - KANSAS STATE UNIVERSITY	Manhattan, KS 2019
Bighorn Sheep Monitoring WOEM 555 - KANSAS STATE UNIVERSITY	Manhattan, KS 2018