Basic Prescribed Burning
South Dakota NRCS Policy

Stan Boltz
State Range Management Specialist
Training, Certification, and Authority

All NRCS employees, in South Dakota (SD), are prohibited from providing any and all technical assistance dealing with prescribed burning unless they have met the minimum training requirements.

Minimum Training Requirements – The National Wildfire Coordinating Group (NWCG) S-190 (Introduction to Wildland Fire Behavior) on-line course will be completed. In addition, a 8-hour Basic Prescribed Burning (in-state) will be completed. This is the minimum training requirement to obtain job approval authority (JAA) for a period of five years. In order to maintain JAA beyond the five-year period, the above mentioned training, equivalent experience and/or more advanced training (e.g., the National Employee Development Center Prescribed Burning Training) must be completed.

Job approval authority should be granted to employees meeting these minimum training requirements for the following burn complexity:
- Fuel Type – Herbaceous, non-volatile fuels only
- Slope – Average slopes less than six percent
- Acreage – Less than 320 acres

Job approval is for conservation planning purposes. If granted, the employee for the above burn complexity, can:
- recommend the prescribed burning practice.
- include prescribed burning in a conservation plan.
- provide clients with a template or example burn plan (job sheet or specification).
- certify that site-specific prescribed burn plans meet the specifications as set forth in the SD Conservation Practice Standard Prescribed Burning (338).
Recommend the prescribed burning practice:
- include prescribed burning in a conservation plan.
- provide clients with a template or example burn plan (job sheet or specification).
- certify that site-specific prescribed burn plans meet the specifications as set forth in the SD Conservation Practice Standard Prescribed Burning (338).

Conservation planning situations involving greater burn complexity than described above should be referred through the field support office to the state resource conservationist.

**Prescribed Burn Plan Development** – SD NRCS employees, with JAA, will direct interested clients to other government agencies, nongovernment organizations, and private consultants who provide that service. Clients may also be directed to these same groups for application assistance. Clients may also develop their own prescribed burn plan.

**Technical Application Assistance**
SD NRCS employees are prohibited from activities such as performing the duties of a designated burn boss or directly assisting with ignition on a prescribed burn.
Welcome

NFA Online in Partnership with the National Wildfire Coordinating Group

Our help desk is available 7 days a week from 8am to 8pm EST at NFAhelp@apstrategies.com or 1-888-834-9970

NEW STUDENTS, click the "New Students Click Here To Register Now!" link below the login box.

RETURNING STUDENTS, enter your User ID and Password.

FORGOT USER ID OR PASSWORD, use the links below the login box for immediate assistance! Click the "Forgot Password?" link for additional assistance.

Reminders:
- User IDs and Passwords are case sensitive.
- After 3 unsuccessful login attempts your account will be locked.
- Please use the Forgot Password/Forgot ID links for immediate assistance.

System Requirements ~ Accessibility ~ Plug-ins ~ Help Desk ~ Home ~ Terms of Use
# 2016 Spring CRP / Grassland Prescribed Fire Landowner Workshops

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td>Registration</td>
</tr>
<tr>
<td>9:00</td>
<td>Introductions</td>
</tr>
<tr>
<td>9:15</td>
<td>USDA Fire Policy</td>
</tr>
<tr>
<td>9:30</td>
<td>USDA CRP Fire Rules</td>
</tr>
<tr>
<td>9:45</td>
<td>SD Fire Laws and Regulations</td>
</tr>
<tr>
<td>10:15</td>
<td>Uses and Benefits of Prescribed Fire for Grassland Management</td>
</tr>
<tr>
<td>10:45</td>
<td>Firebreak Preparation and Fire Behavior</td>
</tr>
<tr>
<td>11:30</td>
<td>Interior/Exterior Hazards and Mitigation</td>
</tr>
<tr>
<td>Noon</td>
<td>Lunch (on your own)</td>
</tr>
<tr>
<td>1:00</td>
<td>Fire Weather Patterns and Planning</td>
</tr>
<tr>
<td>2:30</td>
<td>Fire Tools and Resources</td>
</tr>
<tr>
<td>2:45</td>
<td>Using the SD USDA Burn Plan</td>
</tr>
<tr>
<td>3:30</td>
<td>Optional Sessions</td>
</tr>
<tr>
<td></td>
<td>- Sand table demonstration</td>
</tr>
<tr>
<td></td>
<td>- Individual advisory sessions (bring your maps!!)</td>
</tr>
<tr>
<td></td>
<td>- Equipment demonstration</td>
</tr>
<tr>
<td>4:00</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>

**Watertown:** March 23rd, SDSU Regional Extension Center (Entrance B)

**Huron:** March 24th, NRCS Meeting Room 300, Federal Building

**RSVP:** Jan Rounds, SDSU Extension, 882-5140 or janice.rounds@sdstate.edu
Seating is limited at both locations so please RSVP

---

**FREE WORKSHOP**

Expert advice on **YOUR** burn projects......**bring your maps!!!!!!!**
Producers planning to burn CRP or pastures in spring 2016 are encouraged to attend.
CRP Rules and Regulations

FSA / NRCS staff
Rules

• Rx Fire Must be in Conservation Plan
  – Can request change to other management if desired

• FSA Burn requirements:
  – Qualified burn plan
  – Reviewed by qualified reviewer

• Completion of this course
  – NRCS staff can certify that a written plan meets NRCS standards and can be submitted to local FSA County Committee.
Rx Fire Eligible Practices

- CP1
- CP2
- CP4D
- CP8A
- CP18B
- CP18C
- CP21
- CP25
- CP23
- CP23A
- CP27&28 (FWP)
- CP29
- CP30
- CP37
- CP38E (SAFE)
- CP42
• Mid-contract management (MCM)
  – 10 year contract:
    • yrs. 4, 5, 6
  – 15 year contract:
    • yrs. 4, 5, 6 **AND**
    • yrs. 10, 11, 12
  – Burn Options:
    • All, 1/2, 1/3, 1/4 (allows for rotation, flexibility over time/space)
    • Must complete MCM on all acres in 3 yr. window
  – Burn Dates:
    • **March 1 - April 30th** spring burn cutoff date
      – Primary Nesting Season (PNS) (May 1 – August 1) – cannot burn
Rules

• Cost share and contractor reimbursements
  – FSA reimbursement policy
    • Actual costs up to $48 (with 50% cost share up to $24 returned to landowner)
    • Example: if VFD charges $50/acre, FSA will reimburse $24 max
  
  • Supporting documentation is necessary
    – Invoices, cancelled checks, receipts, analysis tags, other acceptable evidence
    – Landowner cost receipts (itemized expenses: labor, equipment, dates, costs/hr., etc.).
    – Reasonable and customary
• If the producer performed the practice with the producer’s own labor, equipment, or materials, the producer shall submit signed, itemized statements.

• **Statements shall include:**
  – dates of work performed
  – cost per hour charged for labor**
  – type of equipment used
  – charge for equipment
  – type and cost of materials used
  – other applicable information

**Costs for personal labor and personal equipment should be less than that charged by contractors who are entitled to make a profit for their efforts.**
CRP Wetland acres

- Can manage with fire.

- Cannot manage with Haying, Disking, or Grazing.
Summer/Fall Prior to Burn

- Inform USDA Service Center
- Acquire plan template
- Coordinate with Plan Certifier to ensure quality plan
- Submit plan to FSA for approval
- Install Firebreaks in fall (if possible)
- Make Contact With burn providers. VFD's and/or other (especially if you want them to burn it for you)

Spring of Burn

- Improve Firebreaks if needed
- Coordinate with burn provider and inform local emergency services and neighbors
- Engage FSA/NRCS as necessary with plan updates or modifications
- Reseed Firebreaks (disked)

Communicate early and often!
Reseeding Firebreaks

- Plant it back to preexisting seed plan
- Plant it back to a permanent firebreak

NRCS standard allows for 100% legume/forb

OR

a combination of grass/legume/forb
• Questions?
Private Lands
Prescribed Fire
in South Dakota:
Needs,
Opportunities,
and Barriers

Pete Bauman
SDSU Range Field Specialist
Watertown Regional Office

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iGrow.org
If we know all these great things about fire.............

Why aren’t more people using it?
<table>
<thead>
<tr>
<th>Who’s using prescribed fire in SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>- US Fish and Wildlife Service</td>
</tr>
<tr>
<td>- National Park Service</td>
</tr>
<tr>
<td>- US Forest Service</td>
</tr>
<tr>
<td>- Bureau of Land Management</td>
</tr>
<tr>
<td>- NRCS (planning/participation)</td>
</tr>
<tr>
<td>- Native American Tribes</td>
</tr>
<tr>
<td>- Bureau of Indian Affairs</td>
</tr>
<tr>
<td>- SD Dept. of Ag – Division of Wildland Fire</td>
</tr>
<tr>
<td>- SD Dept. of Game, Fish, and Parks: Divisions of Parks, Custer State Park, and Wildlife</td>
</tr>
<tr>
<td>- South Dakota State University</td>
</tr>
<tr>
<td>- The Nature Conservancy</td>
</tr>
<tr>
<td>- Pheasants Forever</td>
</tr>
<tr>
<td>- Private Landowners</td>
</tr>
</tbody>
</table>
Barriers to private lands fire in SD

- Legalities
- Public perceptions
- Neighborhood relations
- Lack of experience, equipment, and skills
- Inappropriate timing
- Lack of training and services
- Competing land uses
Are fire and grazing compatible today?
Fuel and timing must be appropriate to accomplish management goals
Were objectives met?
<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Yankton</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Sisseton</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Leola</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Huron</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Watertown</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>128</strong></td>
</tr>
<tr>
<td>2014</td>
<td>Winner</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Rapid City</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Lemmon</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>69</strong></td>
</tr>
<tr>
<td>2015 spring</td>
<td>Mitchell</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Redfield</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Milbank</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>103</strong></td>
</tr>
<tr>
<td>2015 fall</td>
<td>Aberdeen</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Platte</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Selby</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Kennebec</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>37</strong></td>
</tr>
<tr>
<td><strong>TO DATE</strong></td>
<td></td>
<td><strong>337</strong></td>
</tr>
</tbody>
</table>
2014-2016 NRCS Planning Training Survey Results (153 of 210, 73%)

Human Resources Currently Utilized

- Self: 33%
- Self w/neighbors/friends: 36%
- Others: 9%
- VFD: 6%
- Hired professionals: 16%
2014-2016 NRCS Planning Training Survey Results (153 of 210, 73%)

- lack of skills/proper procedures: 21%
- fear of fire: 7%
- lack of equipment: 16%
- lack of planning: 11%
- other: 16%
- lack of VFD help: 6%
- lack of professional contractors: 9%
- neighbor fears/social pressure: 6%
- liability concerns: 8%
2014-2016 NRCS Planning Training Survey Results (153 of 210, 73%)

Would Students Attend A 2-3 Day Hands-On Fire Training Event

- Yes: 58%
- No: 13%
- Maybe: 29%
State and Federal Agencies can help, but they are limited to classroom training and advising.

National Wildfire Coordinating Group (NWCG) rules govern agency involvement in prescribed fire.

EVERYONE on the fire must adhere to basic NWCG training standards - wildfire, prescribed, or training.
NWCG requires: Basic classes and annual refreshers
NWCG requires: CPR and First Aid
NWCG requires: Fire shelter deployment
NWCG requires: Physical fitness certification
NWCG rules are not compatible with landowners: Until something changes within agencies, this is about as far as we can go.

You Want me to do WHAT?
Get the &^%$# out, and no you cannot finish your pie first!!
Barriers to private lands fire in SD

- Legalities
- Public perceptions
- Neighborhood relations
- Lack of experience, equipment, and skills
  - Inappropriate timing
- Lack of training and services
- Competing land uses
Fire Control of Exotic Grasses

**Figure 9.(100,307),(762,683) Warm and Cool Season Grass Growth Charts.**

Source: The National Drought Mitigation Center

[http://drought.unl.edu/ranchplan/droughtbasics/grassesdrought/seasontimingofplantgrowth.aspx](http://drought.unl.edu/ranchplan/droughtbasics/grassesdrought/seasontimingofplantgrowth.aspx)
### Target Burn Dates for the First Five Years of Establishment of Native Warm Season Grass Stands

| Year   | 1-Apr | 5-Apr | 10-Apr | 15-Apr | 20-Apr | 25-Apr | 30-Apr | 5-May | 10-May | 15-May | 20-May | 25-May | 30-May |
|--------|-------|-------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| Est. no burn | no burn |       |        |        |        |        |        |       |        |        |        |        |        |        |
| Est. plus 1 |       |       |        |        |        |        |        |       |        |        |        |        |        |        |
| Est. plus 2 |       |       |        |        |        |        |        |       |        |        |        |        |        |        |
| Est. plus 3 |       |       |        |        |        |        |        |       |        |        |        |        |        |        |
| Est. plus 4 |       |       |        |        |        |        |        |       |        |        |        |        |        |        |
| Est. plus 5 |       |       |        |        |        |        |        |       |        |        |        |        |        |        |
| Maintenance |       |       |        |        |        |        |        |       |        |        |        |        |        |        |

Information above derived from practices by TNC in the tallgrass prairie regions of the Norther Great Plains.
South Dakota Burn Bans
April 16, 2015

Temporary Burn Bans

Permanent Burn Bans

Modified Year Round Bans
Keeping VFDs Happy in SD

### Primary Nesting Season

<table>
<thead>
<tr>
<th>Burn Dates</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Burns</td>
<td>74</td>
<td>83</td>
<td>230</td>
<td>378</td>
<td>187</td>
<td>234</td>
<td>560</td>
<td>347</td>
<td>284</td>
<td>313</td>
<td>211</td>
<td>90</td>
</tr>
<tr>
<td>Percent</td>
<td>2%</td>
<td>3%</td>
<td>8%</td>
<td>13%</td>
<td>6%</td>
<td>8%</td>
<td>19%</td>
<td>12%</td>
<td>9%</td>
<td>10%</td>
<td>7%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Distribution of VFD fire response 2002-2012 (n=2,991)
Barriers to private lands fire in SD

- Legalities
- Public perceptions
- Neighborhood relations
- Lack of experience, equipment, and skills
- Inappropriate timing
- Lack of training and services
- Competing land uses
Integrating VFDs in Rx Fire

- SD Fire Departments
  - Majority are volunteer
  - ~365 “certified”
- Fundraising
- Community Service
Why VFDs should be interested

• CRP cost share
• Grants
  – SD VFA Grants
  – Equipment
• Training opportunities
  – 90% of VFD training is on structural fire
  – 90% of VFD responses are wildland fire
Barriers to private lands fire in SD

- Legalities
- Public perceptions
- Neighborhood relations
- Lack of experience, equipment, and skills
- Inappropriate timing
- Lack of training and services
- Competing land uses
Prescribed Burn Associations
Prescribed Burn Associations in the Great Plains: ~ 50
### Prescribed Burn Associations in the Great Plains

#### History

<table>
<thead>
<tr>
<th>State</th>
<th># PBAs known in 2012</th>
<th># PBAs responding</th>
<th>Average Date PBA Formed</th>
<th>Oldest PBA Formed</th>
<th>Newest PBA Formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oklahoma</td>
<td>15</td>
<td>11</td>
<td>2006</td>
<td>2002</td>
<td>2012</td>
</tr>
<tr>
<td>Nebraska</td>
<td>15</td>
<td>10</td>
<td>2008</td>
<td><strong>1995</strong></td>
<td>2011</td>
</tr>
<tr>
<td>Texas</td>
<td>12</td>
<td>4</td>
<td>2004</td>
<td>1997</td>
<td>2011</td>
</tr>
<tr>
<td>Kansas</td>
<td>7</td>
<td>2</td>
<td>2009</td>
<td>2001</td>
<td>2007</td>
</tr>
<tr>
<td>Great Plains</td>
<td>50</td>
<td>27</td>
<td>2007</td>
<td>1995</td>
<td>2012</td>
</tr>
</tbody>
</table>
### Prescribed Burn Associations in The Great Plains

#### Performance

<table>
<thead>
<tr>
<th>Survey category</th>
<th>Oklahoma</th>
<th>Texas</th>
<th>Kansas</th>
<th>Nebraska</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of PBAs responding</td>
<td>11</td>
<td>4</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Known # of PBAs</td>
<td>15</td>
<td>12</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Total number of burns conducted</td>
<td>303</td>
<td>348</td>
<td>21</td>
<td>422</td>
</tr>
<tr>
<td>Total acres burned</td>
<td>168,334</td>
<td>188,515</td>
<td>23,970</td>
<td>91,416</td>
</tr>
<tr>
<td>Avg. burns conducted/year</td>
<td>30.3</td>
<td>23.2</td>
<td>4.2</td>
<td>24.8</td>
</tr>
<tr>
<td>Avg. acres burned/year</td>
<td>16,833</td>
<td>12,568</td>
<td>4,794</td>
<td>5,377</td>
</tr>
<tr>
<td>Avg. acres burned/PBA</td>
<td>16,833</td>
<td>47,129</td>
<td>11,985</td>
<td>9,142</td>
</tr>
<tr>
<td>(range)</td>
<td>(0-100,000)</td>
<td>(152-150,000)</td>
<td>(0-23,970)</td>
<td>(500-60,000)</td>
</tr>
<tr>
<td>Avg. acres/burn</td>
<td>556</td>
<td>542</td>
<td>1,141</td>
<td>217</td>
</tr>
</tbody>
</table>
Prescribed Burn Associations in The Great Plains

Objectives
Prescribed Burn Associations in The Great Plains

Needs

Prescribed Burn Association Activity, Needs, and Safety Record: a survey of the Great Plains
Authors: John Weir1, Dirac Twidwell2, and Carissa L. Wonkka3
Member Experience

Prior to joining

[Bar chart showing member experience levels: Most (0%), Some (60%), None (40%)]
Prescribed Burn Associations in The Great Plains

Safety

Prescribed Burn Association Activity, Needs, and Safety Record: a survey of the Great Plains
Authors: John Weir1, Dirac Twidwell2, and Carissa L. Wonkka3
Flint Hills of KS & OK 4/6/11

Disclaimer: Location accuracy of fires may be off by several miles. Please see FAQ for details.

[Map showing fire points in Kansas and Oklahoma]
Mid-Missouri River Prescribed Burn Association: Est. 2016
Motivation Drives Action
Ranchers are losing rangeland. We are all losing grasslands. Not just a Missouri River issue.

The “GREEN GLACIER”
Solutions are graphic
RESTRICTED

UNDER 17 REQUIRES ACCOMPANYING PARENT OR ADULT GUARDIAN

VIOLENCE, GRISLY IMAGES, LANGUAGE, SOME NUDITY AND SEXUALITY
So much hate!!!!
Is there a better way?
Chivalry in The Age of Eastern Redcedar

Kill the women and children first

Dr. John Ortmann
Prescribed Burn Coordinator
Lower Loup Natural Resources District
Ord, Nebraska
Private-Lands Burn Workshop
March 7, 2013 – Yankton, SD
4 phases

windbreak as seed source

- John Ortman
ATTACK!!!
ATTACK!!!
Occasional low intensity fire
Should have attacked yesterday
Mediocre fuels
Mediocre fuels
Without ground fuel, crown fire is the only option

-John Ortman
General Guidelines
Burn as warm and dry as you dare

- John Ortman
Can SD landowners build a fire culture? Mid-Missouri example.
To: MMRPBA Members
Here is a list of the burns we have plans for this spring season.
Please let Sara know as soon as possible if you would like to attend and help with any of these burns.
We will keep you updated on the scheduled day(s) of each burn as the weather conditions forecast.

**MMRPBA Scheduled Burns / 2016**

<table>
<thead>
<tr>
<th>Name</th>
<th>acres</th>
<th>property description</th>
<th>desired wind direction</th>
<th>date completed</th>
<th>burn results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruce Finzen</td>
<td>10</td>
<td>S. Dallas (Emde beehive) CRP grass</td>
<td>NW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dave Steffen</td>
<td>40</td>
<td>6 mi SW Burke - grass</td>
<td>SE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tom Hausmann</td>
<td>200</td>
<td>N edge Bonesteel</td>
<td>SW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rich &amp; Sara Grim</td>
<td>1100</td>
<td>8 mi N Whetstone Bay</td>
<td>NW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jo Ann Sully</td>
<td>3</td>
<td>W. Lake Andes, CRP grass</td>
<td>E</td>
<td>cancelled</td>
<td>FSA changed requirements</td>
</tr>
<tr>
<td>Doug Feltman</td>
<td>63</td>
<td>S. Chamberlain</td>
<td>SE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Also, let us know what equipment you have available to bring to the burn you plan to attend. For example here is a list from Dave Steffen:

- ATV with 12 gal. sprayer
- UTV with 60 gal sprayer
- Weather kit
- 8 walkie talkies
- 2 fire flappers
- 4 drip torches
- 1 leaf blower
- 7 gal drip torch fuel (60/40 diesel/gas)
- ¾ ton 4wd pickup with 250 gal tank & pump
- 2 sections of harrow for mop up on grass
- 5 gal drinking water
- Personal gear (leather boots, gloves, goggles, FR shirt, pants, matches)
- First aid kit

We would like to have all members attend at least one burn this year just for the experience and find out what to expect when you conduct a burn on your own land. We will team you up with experienced people, and give you a chance to do as many jobs as you want to do. The objective is to be safe and keep a control on fire.
The Future: Tools & Resources

www.gpfirescience.org
You and Fire in South Dakota

Info compiled by Steve Harford
Deputy State Fire Marshal  2011
Format modified fall 2016
South Dakota Burn Law History

• Territorial Legislature prior to statehood in 1889
  – burning of fields and sloughs

• Burn Authority Today
  – Townships
  – Counties
  – Municipalities
  – Fire Districts
  – South Dakota Division of Wildland Fire Suppression
  – SD Fire Marshal’s Office
“Having nothing better to do, I set fire to the prairie”

Francis Chadron, Fort Clark, ND - 1839
South Dakota Burn Law History

• Most Municipalities
  – heavily restrict or ban open burning in their city limits.

• Most Counties or Townships
  – will ban or restrict open burning only in times of high fire danger. (County Burn Ban)
State Fire Marshal
• can ban open burning statewide
• Must consult with the Governor
• Never been used as of 2011 (last resort option)
South Dakota Burn Law History

- **SDCL 34-35-9**
- Negligence (misdemeanor)
  - allowing a fire to spread
  - Failure to extinguish fire
  - Failure to interference with control efforts
Every person who negligently kindles or causes to be kindled, fire..... in any woods, brush, fields, marshes, or prairies and leaves it unquenched or who negligently or without full precaution to prevent fire spreading permits it to spread beyond his control so as to endanger the property of another, whether the fire is kindled upon his own land or not,
South Dakota Burn Law History

- SDCL 34-35-9 con’t
- or who, finding any uncontrolled fire burning, *fails to give immediate warning and take reasonable attempts to quench it*, or who at any fire at any place is guilty of any disobedience to the lawful orders of any public official or fireman attempting to control said fire, or who interferes with any such officer in any such case or refuses to assist in controlling said fire, is guilty of a Class 1 misdemeanor.
South Dakota Burn Law History

- SDCL 34-35-
- Burning off land or other flammable material (misdemeanor)
  - without firebreak
  - Without considering weather
• It is a Class 1 misdemeanor to set or cause to be set on fire any woods, marsh, prairie, grass, or stubble land or any other inflammable material at any time of the year without first having in place a natural or manmade firebreak and without giving due caution to the prevailing and forecasted weather conditions.

"Rx" Fire is a prescription, so a plan helps mitigate the above!!!!!!
Before you strike a match....

1. Plan your burn and take into consideration the weather, fuel and topography.

2. Check your jurisdiction for any current burn bans and/or other restrictions that may be in place.

3. Statewide Burn Ban map

make sure we have your email!!
Before you strike a match...

4. Contact local emergency dispatch
   – When
   – Where
   – YOUR callback/contact info
5. If your controlled burn does get out of control, call for assistance as soon as possible.

6. Make sure your controlled burn is "cold out" before leaving it unattended.
South Dakota Burn Law History

- SD Fire Departments
  - Majority are volunteer
  - ~365 “certified”

- VFD Training (historical)
  - Structural
  - Wet stuff on the red stuff
  - Poor history of using fire to fight fire
    - Lack of training
    - Perceived or real liability issues

- We hope to change this!!!!
Questions ????

- Questions ????
Black Hills Fire Protection District

- 1941

- Required a permit from the State of South Dakota or the Black Hills National Forest Service before any open fire could be conducted within the district.
South Dakota Burn Law History

- VFD Training (historical)
  - Structural
  - Wet stuff on the red stuff.
  - Poor history of using fire to fight fire
    - Lack of training
    - Perceived or real liability issues

- We hope to change this!!!!
Uses and Benefits of Rx Fire
Why Burn?

• Grassland Rejuvenation
  – native pastures/prairies/wetland areas
  – Grassland plantings

• Seed Crop

• Litter Removal
  – Site Preparation for seeding/reseeding
Benefits of Fire on the Plains

• Native plants
  • Competition
    – Woody Suppression
    – Cool vs. Warm Season
    – Removal of duff or thatch layer
    – Nutrient Cycling
  • Reproduction
    – Seed viability
    – Seed to soil contact
Benefits of Fire on the Plains

- Grassland animals
  - Highly mobile
  - Burrow under ground
  - Resilient re-nesters
  - Immobile species
    - Burn ‘portions’
    - Recolonization
Benefits of prescribed fire

Habitat and Structure

– Vegetation recovers quickly
– Excellent brooding habitat
– Increases vegetative production/cover
– Nutritious & palatable regrowth
– Habitat “Edge”
– Seed production/viability
– Pollinators
Advantages to Prescribed Fire

• Litter removal – immediate and complete
• Decreases disturbance time
• Target certain species
Timing of Fire

• Considerations
  – What type of grass are you managing for
    • Cool Season Grass vs. Warm Season Grass
    • Introduced Grass vs. Native Grass
  – What is your main objective
    • Remove introduced species from a stand
      – Both Grasses and Woody Vegetation
    • Remove litter

• Timing is key!!
  – Use fire to harm undesirable species and to promote desirable species
Impact on Grasses depends on timing

- Cool Season Grasses
  - Introduced/exotic
    - Smooth Brome
    - Kentucky Bluegrass
    - Quackgrass

- To control
  - burn in May when green and leafy
  - Late fall can be effective (be conscience of weeds)

- Need at least 1 yr. of old grass as fuel

- Don’t graze in year prior to burn
Cool Season Grasses

- Native
  - Canada Wildrye
  - Green Needlegrass
  - Western Wheatgrass
  - Slender Wheatgrass
  - Needle & Thread Grass

To promote
- Burn early in season
- Avoid burning near seed set
- April and May before 2 – 3 leaf stage, OK to burn when cool season exotic grasses are green
- Can hurt these if burn too late in spring

Need about 1 yr. of old grass as fuel

Don’t graze in year prior to burn
Impact on Grasses depends on timing

- **Warm Season Grasses**
  - Native
    - Big Bluestem
    - Little Bluestem
    - Switchgrass
    - Indian Grass
    - Sideoats Grama
    - Blue Grama
    - Buffalo Grass

- To promote
  - burn in April and May before 2 – 3 leaf stage, OK to burn when cool season exotic grasses are green
  - Hard to hurt these with spring burn

- Need about 1 yr. of old grass as fuel

- **Don’t graze** in year prior to burn
FIGURE 9. WARM AND COOL SEASON GRASS GROWTH CHARTS.
SOURCE: THE NATIONAL DROUGHT MITIGATION CENTER
HTTP://DROUGHT.UNL.EDU/RANCHPLAN/DROUGHTBASICS/GRASSES/DROUGHT/SEASONTIMINGOFPLANTGROWTH.ASPX
Often mundane
Overall Results

Prairie Coteau Habitat Partnership
Private Lands Prescribed Burning Program
All GRASS PLANTINGS (Establishment and Maintenance)
Northeast South Dakota, 2004 - 2012
n=59
Production Results

2011 Total Biomass Production

<table>
<thead>
<tr>
<th>Management Category</th>
<th>2011 Total Biomass Production Unburned (lbs/acre)</th>
<th>2011 Total Biomass Production Burned (lbs/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-private native prairie/pasture, n=17</td>
<td>3,000</td>
<td>4,000</td>
</tr>
<tr>
<td>G-Agency native prairie/pasture, n=26</td>
<td>2,500</td>
<td>3,500</td>
</tr>
<tr>
<td>D-Mature low diversity CRP, n=8</td>
<td>3,500</td>
<td>4,500</td>
</tr>
<tr>
<td>F-Mature high diversity plantings, n=2</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>All Categories Avg., n=53</td>
<td>3,500</td>
<td>4,500</td>
</tr>
</tbody>
</table>
Production Results

Native Warm Season Grass (WSG) Biomass Production, 2011-2013

- Unburned (lbs/acre)
- Burned (lbs/acre)

Warm Season Grasses, Avg all categories, 2011-2013
Production Results

2011 Native Cool Season Grass (CSG) Biomass Production

Management Category

A-private native prairie/pasture, n=17
G-Agency native prairie/pasture, n=26
D-Mature low diversity CRP, n=8
F-Mature high diversity plantings, n=2
All Categories Avg., n=53

Lbs. / Acre

Unburned (lbs/acre)
Cattle Weight Gains / Grassland Health

Forage Production Lane Tekroney Pasture:
2006 results

<table>
<thead>
<tr>
<th>Paired Plot</th>
<th>burned</th>
<th>unburned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>2</td>
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<td>5</td>
<td>2400</td>
<td>1100</td>
</tr>
<tr>
<td>Avg</td>
<td>2300</td>
<td>660</td>
</tr>
</tbody>
</table>
Invasive Species Encroachment
Meeting Your Goals

- Control of Introduced Cool-season Grass in Warm-season CRP
  - Spring fire – Burn as close to the April 30th deadline as possible

- Control of Cool-season Introduced Grass in Cool-season CRP
  - Early Spring fire – Small window of opportunity when intro grass is growing and natives are still dormant

- Control of Invasive Trees in Grasslands (Pasture or CRP)
  - Early spring fire – Burn when trees are just putting on buds
• Questions
Typical SD Weather Patterns

Darren R. Clabo
SD State Fire Meteorologist
Department of Atmospheric Sciences, SDSM&T
Outline

– High Pressure Systems, Low Pressure Systems
– Cold Fronts, Warm Fronts

ANTICIPATE!!!!

The Weather
Pressure Systems

- Surface high and low pressure systems are caused by **disturbances in the upper atmosphere**
  - *Jet Stream* (fast moving current of air **roughly 25,000 – 35,000 ft** above the surface)
Black line is jet stream pattern

Surface low pressure system location ahead of trough

Surface high pressure system location behind trough

jet stream (upper levels) map can give you an idea of what the surface weather pattern looks like
Surface Pressure Systems and Wind

- Wind blows counterclockwise into (around) low pressure systems
- Wind blows clockwise out of (around) high pressure systems
Frontal Systems

• Fronts are basically the boundary between two air masses of different characteristics
  • *Surface pressure falls before a front passes and rises after a front passes!!!*
    – Frontal movement is directed by movement of high and low pressure systems
    – **Low pressure** systems generally have a warm front, a cold front, and sometimes a dryline
    – **High pressure** systems *do not* have fronts associated with them
Low pressure systems typically form in the lee of the Rockies and move east/northeast while high pressure systems seem to drop in from Alberta/Saskatchewan behind the lows.

- **Cool, moist air**
- **Cool/cold, dry air**
- **Warm, moist air**

Black arrow denotes direction of pressure center movement.
Fronts and Precipitation

• Frontal boundaries are typically areas of precipitation
  – **Cold fronts**
    • Strong squalls, supercells, thunderstorms
  – **Warm fronts**
    • Typically rain/drizzle events
    • Severe weather may be present south of the warm front in the warm/moist air
Green shaded area denotes typical region of precipitation
Fronts and the Wind
all descriptions below are examples of typical behavior

• Warm Front
  – Before passage: easterly or northeasterly
  – After passage: southerly or southeasterly

• Cold Front
  – Before passage: southerly or southeasterly, can be gusty, don’t always bring moisture
  – After passage: gusty northwesterly winds
Critical SD Fire Weather Patterns

• Pre cold front
  – Strong *southerly* winds may develop
  – If RHs are low enough, may promote large fire growth

• Post cold front
  – Strong *northwesterly* winds bring drier air into region
  – *180 degree wind shift!!!*
  – Especially dangerous if frontal passage is dry
  – Cooler temperatures may exist but that may not inhibit a wind-driven prairie fire
  – *Dry cold frontal passages are the cause of most Red Flag Warning* days across eastern SD
Conclusions

• Knowledge of typical frontal behavior can give insight into future (1-2 days) weather

• If the forecast calls for a front, be ready for change!
Conclusions

• Questions?
Weather and Visual Clues

Darren R. Clabo
SD State Fire Meteorologist
Department of Atmospheric Sciences, SDSM&T
Outline

• This section will address how to identify certain weather phenomena and patterns by simply watching the clouds and the smoke column
Thunderstorms

• Thunderstorms form under unstable conditions
  – Hot and humid days. Along or ahead of fronts.

• Thunderstorms exist in one of three stages
  – Towering, mature, and dissipation stages
  – Each present their own unique challenges to fire managers
Courtesy of the Department of Atmospheric Sciences
University of Illinois at Urbana-Champaign
Single Cell Storm Life Cycle

- **Towering Cumulus Stage**
- **Mature Stage**
- **Dissipating Stage**
Cumulonimbus clouds, hot, moist, winds out of the southeast
Altostratus clouds, somewhat cool, moist, winds out of the east/northeast
Run Away!!!

Cumulonimbus clouds, hot, moist, winds out of the south
Clearing skies, cool, dry, breezy west/northwesterly winds
Smoke Column Attributes

- Watching the smoke column
- Things to think about
  - Is the smoke column vertical or tilted?
  - Does the smoke blow one direction through one layer, then another direction through a progressively higher layer?
  - Is the smoke rising to great heights or is it having a hard time leaving the ground?
  - Is the smoke flowing downhill into drainages?

Watch other’s smoke before you light!!!
Vertically Developed Smoke Column

- Smoke column moving straight up
  - Unstable lower layer
  - Little to no surface winds
  - Note the cirrus clouds in the background, could that imply an impending storm system?
Tilted Smoke Column

- Little wind near surface with stronger winds aloft
- Good initial lift, good smoke dispersal
Temperature Inversions

- Good lift initially
- Smoke then hits inversion level and spreads out

Summary

• The clouds and smoke can give many details about what the atmosphere is doing
• You **must** use these clues to your advantage!
Summary

• Questions?
Nimbostratus clouds, rainy, cool, moist, winds out of the east
Cirrus clouds, warm, moist, winds out of the east/southeast
Fire Weather Forecasts

Darren R. Clabo
SD State Fire Meteorologist
Department of Atmospheric Sciences, SDSM&T
Outline

• This section will cover each piece of a typical National Weather Service style fire weather forecast
  – Discussion
  – Sky weather
    – Temperature/Relative Humidity
    – 20-ft Wind
    – PoP / Chance of Wetting Rain
    – Mixing Height
    – Transport Wind
    – Transport winds and Ventilation Index
Temperature/Relative Humidity

• Daytime temperature and relative humidity (RH) are given for the peak burning period

– Hottest/driest conditions during the day
Temperature/RH Relationships

• The basics
  – Temp./RH are inversely related
  – When temperature increases, relative humidity decreases
  
  • If the dew point remains constant!
The 20-ft wind is the wind speed 20 feet above any vegetation cover:
- 20 feet above 2-ft tall grasses
- 20 feet above the canopy of 80 feet tall pine trees
20 ft Wind

• Wind speed
  – Winds generally increase with height above the surface
    • Due ground frictional effects
PoP/CWR

• Probability of Precipitation (PoP)
  – A percentage chance of getting precipitation
  – “A 20% chance of rain” is a relatively low probability of rain

• Chance of Wetting Rain (CWR)
  – A wetting rain is defined as 0.10 inch of precipitation
    • A CWR is often given to determine the odds of a fuel-wetting precipitation event
    • “A 50% chance of a wetting rain” implies good odds of rain and a 50/50 chance of getting above 0.10 inch
Mixing Height

• Important

• The mixing height is the height at which air is vertical mixed from the surface
  – Higher mixing heights will result in taller smoke columns (bigger number is better!!)

• Given for peak burning period

• Driven by the sun heating the ground creating rising warm air
Mixing Height

• Daytime Mixing
  – If air raises, air must sink from high up to replace it
  – Sinking air warms adiabatically (compressional heating)
  – Sinking air can bring windy conditions aloft to the surface
  – Ground is basically source of moisture
    • Mixing will decrease surface dew point because moisture is being transported upwards
  – Hot days are quite turbulent to low flying aircraft
• Sun warms ground
• Ground warms air
  – Air rises and cools at adiabatic lapse rate
  – Creates ‘void’ of air near surface
  – Low pressure ‘attracts’ more air
  – Air from above replaces it
• Sinking parcels warm adiabatically

Mixing Height
Temperature/RH Relationships

• Daytime Mixing- When does this happen?
  – Every day
  – Maximized with stronger sunlight
  – Highest mixing heights are generally found in late summer 1-4 days ahead of fronts
  – **Higher mixing heights = greater fire danger**
    • Higher temperatures and lower RHs
  – A very high mixing height would be anything over ~ 8,000 ft. A low mixing height would be less than 500 ft.
Mixing Height

- Daytime Mixing - Visual Indicators
  - Smoke column stops rising
  - Cumulus cloud base
Transport Wind

• Transport Winds
  – Average wind speed in mixed layer
  – A good measure of how your smoke will move
Ventilation Index

- The Ventilation Index (Smoke Dispersion Index) combines the mixing height with the transport wind.

- A set of smoke dispersion adjectives results:
  - Poor
    - Smoke will spread out horizontally and cover the ground near the fire
  - Marginal
    - Smoke tends to lift but may linger or drift very slowly
  - Fair
    - Smoke lifts but may be removed slowly
  - Good
    - Smoke has no problem being evacuated from the fire area
  - Excellent
    - Smoke rises strongly vertically and is quickly transported away from fire area. Typically happens on days where large fire growth is possible.
Good Smoke Dispersion

Poor Smoke Dispersion

http://www.gov.mb.ca/agriculture/soilwater/soil/fbd09s03.html
Summary

– Realize that smoke dispersal is becoming a bigger deal in terms of air quality regulations
– Good neighbors avoid ‘smoking’ their neighbors!!
Summary

– Questions?
Obtaining Weather Data and Forecasts

Darren R. Clabo
SD State Fire Meteorologist
Department of Atmospheric Sciences, SDSM&T
Outline

• This section covers the locations/websites where you can obtain forecasts and weather data
Good Places to Go

• The National Weather Service is the premier place to get fire weather forecasts
  – [www.weather.gov](http://www.weather.gov)
  – Aberdeen fire weather page
    [http://www.crh.noaa.gov/abr/?n=fire_weather.php](http://www.crh.noaa.gov/abr/?n=fire_weather.php)
  • If have internet access, go to [www.weather.gov](http://www.weather.gov), and walk through steps i – xiv. of section S. 7_4_Getting Weather.
  • if no internet, use next series of slides (6–28) to illustrate NWS tools/resources
Late Season Winter Storm Impacting the Northeast And Southern New England

A low pressure system off the Northeast Coast will track northeast into Monday. Snow is expected to continue into Monday morning over portions of the Northeast and southern New England. Heavy snow is expected from eastern Long Island to Boston, including Cape Cod and Rhode Island. Travel impacts are likely.

Fair
46°F
8°C

This Afternoon
Mostly Sunny
High: 54°F

Tonight
Mostly Cloudy
Low: 33°F
Late Season Winter Storm Impacting the Northeast And Southern New England

A low pressure system off the Northeast Coast will track northeast into Monday. Snow is expected to continue into Monday morning over portions of the Northeast and southern New England. Heavy snow is expected from eastern Long Island to Boston, including Cape Cod and Rhode Island. Travel impacts are likely.

Read More...
**Watertown, Watertown Municipal Airport (KATY)**

- **Humidity:** 46%
- **Wind Speed:** SE 10 mph
- **Barometer:** 29.79 in (1010.1 mb)
- **Dewpoint:** 26°F (-3°C)
- **Visibility:** 10.00 mi
- **Wind Chill:** 41°F (5°C)
- **Last update:** 21 Mar 12:53 pm CDT

**Extended Forecast for 3 Miles ESE Watertown Municipal Airport SD**

<table>
<thead>
<tr>
<th>Day</th>
<th>This Afternoon</th>
<th>Tonight</th>
<th>Tuesday</th>
<th>Tuesday Night</th>
<th>Wednesday</th>
<th>Wednesday Night</th>
<th>Thursday</th>
<th>Thursday Night</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mostly Sunny</td>
<td>Partly Cloudy</td>
<td>Partly Sunny</td>
<td>20%</td>
<td>20%</td>
<td>30%</td>
<td>Sunny</td>
<td>Partly Cloudy</td>
<td>20%</td>
</tr>
<tr>
<td><strong>High:</strong></td>
<td>54°F</td>
<td>Low: 32°F</td>
<td>High: 51°F</td>
<td>Low: 28°F</td>
<td>High: 34°F</td>
<td>Low: 18°F</td>
<td>High: 36°F</td>
<td>Low: 26°F</td>
<td>High: 47°F</td>
</tr>
<tr>
<td><strong>Low:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Detailed Forecast**

- **This Afternoon:** Mostly sunny, with a high near 54. South southeast wind 11 to 14 mph.
- **Tonight:** Partly cloudy, with a low around 32. South southeast wind 5 to 10 mph.
- **Tuesday:** Partly sunny, with a high near 51. North northeast wind 6 to 15 mph.
Detailed Forecast

This Afternoon: Mostly sunny, with a high near 54. South southeast wind 11 to 14 mph.

Tonight: Partly cloudy, with a low around 32. South southeast wind 5 to 10 mph.

Tuesday: Partly sunny, with a high near 51. North northeast wind 6 to 15 mph.

Tuesday Night: A slight chance of rain after 8pm, mixing with snow after 3am. Mostly cloudy, with a low around 28. Northeast wind 15 to 18 mph. Chance of precipitation is 20%.

Wednesday: A chance of snow, mainly after 2pm. Cloudy, with a high near 34. Breezy, with a northeast wind 21 to 23 mph, with gusts as high as 32 mph. Chance of precipitation is 30%.

Wednesday Night: A chance of snow before 8pm. Mostly cloudy, with a low around 18. Blustery. Chance of precipitation is 30%.

Thursday: Sunny, with a high near 38.

Thursday Night: Partly cloudy, with a low around 26.

Friday: A slight chance of snow before 11am, then a slight chance of rain and snow between 11am and noon, then a slight chance of rain after noon. Partly sunny, with a high near 47. Chance of precipitation is 20%.

Friday Night: A chance of rain before midnight, then a chance of rain and snow between midnight and 1am, then a chance of snow after 1am. Mostly cloudy, with a low around 27. Chance of precipitation is 30%.

Saturday: A chance of snow. Partly sunny, with a high near 41. Chance of precipitation is 30%.

Saturday Night: Mostly cloudy, with a low around 26.

Sunday: Mostly sunny, with a high near 43.

Additional Forecasts and Information
Late Season Winter Storm Impacting the Northeast And Southern New England

A low pressure system off the Northeast Coast will track northeast into Monday. Snow is expected to continue into Monday morning over portions of the Northeast and southern New England. Heavy snow is expected from eastern Long Island to Boston, including Cape Cod and Rhode Island. Travel impacts are likely.

Read More...
National Weather Service

Watches, Warnings & Advisories

Local weather forecast by "City, St" or zip code City, St

Red Flag Warning

URGENT - FIRE WEATHER MESSAGE
NATIONAL WEATHER SERVICE RAPID CITY SD
236 AM MDT MON MAR 21 2016

...RED FLAG WARNING IN EFFECT MONDAY FOR GUSTY WINDS AND LOW RELATIVE HUMIDITY ACROSS PARTS OF NORTHEASTERN WYOMING AND FAR SOUTHWESTERN SOUTH DAKOTA...

._UPPER-LEVEL HIGH PRESSURE WILL BRING VERY WARM AND BREEZY CONDITIONS TO PARTS OF NORTHEASTERN WYOMING AND FAR SOUTHWESTERN SOUTH DAKOTA TODAY. WINDS ARE EXPECTED TO INCREASE BY MID-TO-LATE MORNING AS THE ATMOSPHERE MIXES OUT.

SDZ263-WYZ259-298-220200-
/O.CON.KUNR.FW.W.0004.160321T1600Z-160322T0200Z/
SOUTHWESTERN SOUTH DAKOTA-SOUTHERN CAMPBELL-
CROOK AND WESTON COUNTY PLAINS-
236 AM MDT MON MAR 21 2016

...RED FLAG WARNING REMAINS IN EFFECT FROM 10 AM THIS MORNING TO 8 PM MDT THIS EVENING FOR GUSTY WINDS AND LOW RELATIVE HUMIDITY FOR FIRE WEATHER ZONES 259...263 AND 298...

* AFFECTED AREA...FIRE WEATHER ZONES 259...263 AND 298.

* WINDS...WEST 10 TO 20 MPH WITH GUSTS UP TO 35 MPH.

* RELATIVE HUMIDITY...AS LOW AS 13 PERCENT.
Extreme Fire Danger

RANGELAND FIRE DANGER STATEMENT
NATIONAL WEATHER SERVICE RAPID CITY SD
229 AM MDT MON MAR 21 2016

DISCUSSION...TODAY WILL BE VERY WARM WITH HIGHS FROM 65 TO 75...
...OR ABOUT 20 DEGREES ABOVE AVERAGE. MINIMUM AFTERNOON RELATIVE
HUMIDITIES WILL RANGE FROM 12 TO 22 PERCENT. WEST TO SOUTHWEST
WINDS WILL INCREASE TO 10 TO 20 MPH...BUT WILL BE 15 TO 30 MPH
WITH SOME GUSTS TO 35 MPH OVER FAR NORTHWESTERN AND SOUTHWESTERN
SOUTH DAKOTA. THERE WILL BE CONSIDERABLE HIGH CLOUDS...BUT STILL
ENOUGH BREAKS FOR PERIODIC SUNSHINE.

THE GRASSLAND FIRE DANGER INDEX WILL BE IN THE HIGH TO EXTREME
CATEGORY FOR TODAY.

SDZ001-041-212100-
HARDING-FALL RIVER-
INCLUDING THE CITIES OF...BUFFALO...ARDMORE...OELRICHES
229 AM MDT MON MAR 21 2016

...EXTREME FIRE DANGER...

THE GRASSLAND FIRE DANGER INDEX WILL REACH THE EXTREME CATEGORY
THIS AFTERNOON. EXTREME WEATHER CONDITIONS OR A VERY LOW
MOISTURE CONTENT OF GRASSES...AND OTHER DRY ORGANIC MATERIAL
ON THE GROUND...INDICATE THAT CRITICAL BURNING CONDITIONS EXIST.
A FIRE WILL START EASILY AND HAS THE POTENTIAL TO BECOME LARGE
AND SPREAD QUICKLY BECOMING ERRATIC WITH EXTREME BEHAVIORAL
CHARACTERISTICS. NO OUTDOOR BURNING SHOULD TAKE PLACE.

THE OUTLOOK FOR TUESDAY AFTERNOON...THE GRASSLAND FIRE DANGER
INDEX WILL REACH THE MODERATE CATEGORY TO HIGH CATEGORY.

$$
Select a zone from the map above to get the Fire Weather Forecast for that zone. Otherwise select a link below.

- Fire Weather Forecast by Zone for Northeast/Central SD & Extreme West-Central MN
- Fire Weather Forecast for Southeast SD (NWS Sioux Falls)
- Fire Weather Forecast for Western SD (NWS Rapid City)

Other Fire Weather Forecast Information

- Most recent Fire Weather Watches/Red Flag Warnings issued by NWS Aberdeen
- National Fire Weather Forecast from the Storm Prediction Center (SPC)
- South Dakota Grassland Fire Danger Map

- Issued daily by 5:00 AM during the Fire Weather Season or when when very high or extreme grassland fire danger is forecast.
Routine Fire Wx Fcst (With/Without 6-10 Day Outlook)
Issued by NWS Aberdeen, SD

997
FNUS53 KABR 210835
FwFABR

FIRE WEATHER FORECAST FOR CENTRAL/NE SOUTH DAKOTA WC MN
NATIONAL WEATHER SERVICE ABERDEEN SD
335 AM CDT MON MAR 21 2016

.DISCUSION...
AN AREA OF LOW PRESSURE WEST OF THE REGION WILL DRAW WARMER
TEMPERATURES INTO THE DAKOTAS AND MINNESOTA TODAY. THE MUCH ABOVE
NORMAL TEMPERATURES AND DRY AIRMASS WILL PRODUCE AFTERNOON
HUMIDITY VALUES IN THE TEENS AND 20 PERCENT RANGE WEST OF THE
JAMES RIVER VALLEY. THANKFULLY WINDS RANGE BELOW 20 MPH TODAY.
STRONGER WINDS ARE POSSIBLE IN EASTERN SOUTH DAKOTA WHERE
AFTERNOON HUMIDITY VALUES WILL BE IN THE 40 PERCENT RANGE.

SDZ272-212145-
PRAIRIE COTEAU-
335 AM CDT MON MAR 21 2016

.TODAY...
SKY/WEATHER..........MOSTLY SUNNY (40-50 PERCENT CLOUD).
MAX TEMPERATURE.....50-55.
MIN HUMIDITY.......35-40 PERCENT.
20-FOOT WINDS......SOUTHEAST WINDS 10 TO 15 MPH.
HAINES INDEX........5 OR MODERATE.
MIXING HEIGHT.......AROUND 2700 FT AGL (AFTERNOON MAX).
TRANSPORT WINDS.....SOUTHEAST 18 TO 23 MPH.
SMOKE DISPERSAL......AROUND 42000 OR FAIR (AVE 12-6 PM).
LAI..................1.
CWR..................ZERO.

.TONIGHT...
SKY/WEATHER.........PARTLY CLOUDY (40-50 PERCENT CLOUD) THEN
BECOMING MOSTLY CLOUDY (50-60 PERCENT CLOUD).
MIN TEMPERATURE....30-35.
.TONIGHT...
SKY/WEATHER........PARTLY CLOUDY (40-50 PERCENT CLOUD) THEN BECOMING MOSTLY CLOUDY (50-60 PERCENT CLOUD).
MIN TEMPERATURE...........30-35.
MAX HUMIDITY..............91-96 PERCENT.
20-FOOT WINDS...........SOUTHEAST WINDS 5 TO 10 MPH SHIFTING TO THE EAST AFTER MIDNIGHT.
HAINES INDEX...........5 OR MODERATE.
LAL......................1.
CWR......................ZERO.

.TUESDAY...
SKY/WEATHER........PARTLY SUNNY (65-75 PERCENT CLOUD).
MAX TEMPERATURE...........48-53.
MIN HUMIDITY..............55-60 PERCENT.
20-FOOT WINDS...........NORTHEAST WINDS 5 TO 15 MPH.
HAINES INDEX...........5 OR MODERATE.
MIXING HEIGHT...........AROUND 2300 FT AGL (AFTERNOON MAX).
TRANSPORT WINDS...........NORTHEAST 16 TO 21 MPH.
SMOKE DISPERSAL...........AROUND 43000 OR FAIR (AVE 12-6 PM).
LAL......................1.
CWR......................ZERO.

.FORECAST DAYS 3 THROUGH 7...
.WEDNESDAY...CLOUDY WITH A SLIGHT CHANCE OF RAIN OR SNOW. LOWS IN THE UPPER 20S. HIGHS IN THE UPPER 30S. NORTHEAST WINDS 10 TO 20 MPH.
.THURSDAY...PARTLY CLOUDY. LOWS AROUND 19. HIGHS IN THE UPPER 30S.
.NORTH WINDS 10 TO 20 MPH.
.FRIDAY...MOSTLY CLOUDY. A SLIGHT CHANCE OF RAIN AND SNOW. LOWS IN THE UPPER 20S. HIGHS IN THE MID 40S. SOUTHWEST WINDS 5 TO 15 MPH.
.SATURDAY...MOSTLY CLOUDY. A CHANCE OF SNOW AND RAIN. LOWS IN THE UPPER 20S. HIGHS IN THE LOWER 40S. NORTHEAST WINDS 5 TO 10 MPH.
.SUNDAY...PARTLY CLOUDY. LOWS IN THE MID 20S. HIGHS IN THE LOWER 40S. NORTHEAST WINDS 5 TO 10 MPH.

$$
WEATHER.GOV/ABERDEEN
Understanding the Red Flag Warning System

- Red Flag Warning is based on:
  - Wind Speed
  - Relative Humidity
- Relative Greenness
- Experimental Live Moisture
- Greenness 4-Panell Display

Fuel and Soil Moisture
- 10-hour Fuel Moisture - computed for 1/2 inch diameter fuels
- 100-hour Fuel Moisture - computed for 1-3 inch diameter fuels
- 1000-hour Fuel Moisture - computed for 3-6 inch diameter fuels

Lower Atmospheric Stability
- Haines Index across the U.S.

Wildland Fire Status
- NOAA Fire and Smoke Maps
- Satellite Smoke Text Product
- South Dakota
- Minnesota
- National
- Minnesota Wildfire Information

Miscellaneous Fire Weather Information
- National Fire Weather Information
- National Interagency Fire Center (NIFC)

Coordination Centers
- Rocky Mountain Area Coordination Center
- Eastern Area Coordination Center

Situation Reports/Fire Dangers
- Rocky Mountain Area Daily Situation Report
- Eastern Area Daily Situation Report
- National Situation Report
- Rocky Mountain Area Fuel Status

2015 Rocky Mountain Area Fire Weather Annual Operating Plan
2016 Minnesota Fire Weather Annual Operating Plan
Select a zone from the map above to get the Fire Weather Forecast for that zone. Otherwise select a link below:

- Fire Weather Forecast by Zone for Northeast/Central SD & Extreme West-Central MN
- Fire Weather Forecast for Southeast SD (NWS Sioux Falls)
- Fire Weather Forecast for Western SD (NWS Rapid City)

Other Fire Weather Forecast Information

- Most recent Fire Weather Watches/Red Flag Warnings issued by NWS Aberdeen
- National Fire Weather Forecast from the Storm Prediction Center (SPC)
- South Dakota Grassland Fire Danger Map
  - Issued daily by 5:00 AM during the Fire Weather Season or when when very high or extreme grassland fire danger is forecast.

- Graphical Fire Weather Products
- Interactive Gridpoint Forecasts

Observations

- Observation Monitoring and Analysis Network (ROMAN)
SD Grassland Fire Danger: Tue, Mar 22, 2016
Understanding the Grassland Fire Danger Index

- Grassland Fire Danger Index is based on
  - Wind Speed
  - Relative Humidity
  - Temperature
  - Fuel cure
  - (brownness vs. greenness)
### SD Grassland Fire Danger Index Tool

*(Darren Clabo South Dakota State Fire Meteorologist)*

#### GFDI Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0 to 2</td>
</tr>
<tr>
<td>Moderate</td>
<td>3 to 7</td>
</tr>
<tr>
<td>High</td>
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<td>Extreme</td>
<td>50+</td>
</tr>
</tbody>
</table>

#### Grassland Fire Danger Inex Tool

<table>
<thead>
<tr>
<th>Grassland Fire Danger Inex</th>
<th>Vegetation Cure (%)</th>
<th>Temp (C)</th>
<th>Wind V (km/hr)</th>
<th>RH (%)</th>
<th>Temp (F)</th>
<th>Wind V (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
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*Unsecure fire unit*

*Secure fire unit*

*This is America*
### SD Grassland Fire Danger Index Tool

(Darren Clabo South Dakota State Fire Meteorologist)

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**GFDI Categories**
- **Low**: 0 to 2
- **Moderate**: 3 to 7
- **High**: 8 to 19
- **Very High**: 20 to 49
- **Extreme**: 50+

- **Example**
  - **Extreme conditions**

- **Secure fire unit**
- **Unsecure fire unit**
South Dakota FSA / NRCS
Burn Plan Guidelines

- **PRESCRIBED BURN WEATHER AND TIME PARAMETERS:**
  - Listed here are PRACTICAL weather conditions within which are designed to help insure the burn is conducted under safe and manageable circumstances.
  - **Recommended basic/manageable weather parameters for private lands**
    - **Air Temperature:** 40°-75°F
    - **Relative Humidity:** 25%-50%
    - **20 Ft Wind Speed/Forecasted Wind Speed:** 20 mph maximum
    - **Ground Level Wind Range:** 5-16 mph
### SD Grassland Fire Danger Index Tool

(Darren Clabo, South Dakota State Fire Meteorologist)

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- SD Burn Plan
- Min temp
- Min wind
- Max RH

Unsecure fire unit
- SD Burn Plan
- Max temp
- Max wind
- Min RH

SD Grassland Fire Danger Index Tool

(Darren Clabo South Dakota State Fire Meteorologist)

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### SD Grassland Fire Danger Index Tool

#### Vegetation Cure (%)

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</tr>
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</table>

**Do Not recommend burning when all three factors are at prescription extremes**

**Unsecure fire unit**

**Secure fire unit**
Other Places

• The NWS Storm Prediction Center has wildland fire potential outlooks
  – http://www.spc.noaa.gov/products/fire_wx/overview.html
Other Places

• SD State Fire Meteorologist
  – Has a variety of useful products/links
  – Issues daily state-wide forecasts during fire season
    • http://www.ias.sdsmt.edu/clabo/index.htm
Smart Phones

Iphone App here:  

Android App here:  
*2015 was the first year we compiled statewide burn ban status
*Make sure we have your email for SDGRASSINFO updates
Summary

– Questions?
Severe Thunderstorms Possible for Parts of Gulf Coast and Southeast

The NWS Storm Prediction Center is forecasting a risk of severe thunderstorms late Tuesday into early Wednesday for parts of the central and eastern Gulf Coast and Southeast. The primary threats will be large hail and damaging winds. In addition, flooding and flash flooding is possible from southern Mississippi to southern Georgia.

4 MILES WNW SENECA SD

Current conditions at Mobridge Municipal Airport (KMBG)
Lat: 45.55 Long: -100.41 Elev: 1667 ft.

TODAY
- Mostly Cloudy
- Low: 20°F
- High: 37°F

TOMORROW
- Slight Chance of Snow
- Low: 21°F
- High: 37°F

THURSDAY
- Snow
- Likely
- Low: 13°F
- High: 22°F

FRI
- Snow
- Chance Flurries
- Low: 8°F
- High: 18°F

SATURDAY
- Mostly Cloudy
- Low: 0°F
- High: 29°F

7-DAY FORECAST

Tonight
- Mostly Cloudy, with a low around 20. West wind 9 to 11 mph.

Wednesday
- A 20 percent chance of snow before noon. Partly sunny, with a high near 37. Breezy, with a west wind 11 to 16 mph increasing to 18 to 23 mph in the afternoon. Winds could gust as high as 32 mph.
Hourly Weather Graph

<table>
<thead>
<tr>
<th>Weather Elements</th>
<th>Weather Precipitation</th>
<th>Probabilistic Forecasts (Experimental)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°F)</td>
<td>Thunder</td>
<td>Quantitative Precipitation 6-hr info</td>
</tr>
<tr>
<td>Dewpoint (°F)</td>
<td>Rain</td>
<td>0.10 0.25 0.50 1.00</td>
</tr>
<tr>
<td>Wind Chill (°F)</td>
<td>Snow</td>
<td>Snowfall 6-hr info</td>
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<td>Freezing Rain</td>
<td>0.1in 1in 3in 6in 12in</td>
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<td>Sleet</td>
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<td>Surface Wind mph</td>
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<td>Sky Coverage</td>
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<td>Precipitation Potential</td>
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<tr>
<td>Relative Humidity</td>
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</table>

48-Hour Period Starting: 6pm Tue, Feb 12 2013

[Graph showing hourly weather data for 48 hours, including temperature, dewpoint, wind chill, precipitation, and relative humidity.]
Weather Effects on Fire

Darren R. Clabo
SD State Fire Meteorologist
Department of Atmospheric Sciences, SDSM&T
Outline

• This section outlines other phenomena you might come across while you burn
Fire Whirls
Pyrocumulus
Fire Behavior and Fire Breaks
Wind Effects
Headfire – ‘With the Wind’
Headfire – ‘With the Wind’
Headfire – ‘With the Wind’
Backfire – ‘Against the Wind’
Backfire – ‘Against the Wind’
Ignition Techniques
Ignition Techniques

RING-FIRE IGNITION

WIND
Ignition Techniques

[Diagram of strip headfire ignition with wind direction]
Topographical Effects

- Slope: Steepness
- Aspect: Direction slope faces
- Position: Fire location on slope
Topographical Effects - Slope

Convection and Radiant Heat

Flame is closer to fuel
Topographical Effects - Slope
Wind and Weather Effects
Wind and Weather Effects
Firebreaks

- Any barrier, boundary, or control line that reduces or eliminates the ability of fire to spread
  - ‘Hard’ firebreak: Eliminates the spread of fire under normal conditions. Headfires require a ‘harder’ firebreak than backing or flanking fires.
  - ‘Soft’ firebreak: Reduces the spread or intensity of fire under normal conditions. Effect on fire spread can be variable depending on conditions
Firebreaks

• Examples
  – **Hard firebreaks**: Dependent on fire intensity
    • Water and wet areas
    • Mineral soils and rock areas
    • Previously burned areas
    • Green Lawns
  – **Soft firebreaks**: Change in fuel composition or structure, may act like a hard break under certain weather /moisture/time of year conditions.
    • Mowed firebreaks
    • Late spring/midsummer ‘green’ grasslands
    • Crop residue
    • Pasture
    • Crops
    • Dry or dormant lawns
Hard Firebreaks – Water/Wet Areas
Hard Firebreaks – Water/Wet Areas
Hard Firebreaks – Water/Wet Areas
Hard Firebreaks – Water/Wet Areas
Hard Firebreaks – Water/Wet Areas
Hard Firebreaks – Water/Wet Areas
Hard Firebreaks – Mineral Soils/Rock
Hard Firebreaks – Mineral Soils/Rock
Hard Firebreaks – Previous Burns
Hard Firebreaks – Previous Burns
Soft Firebreaks – Green Grasslands
Soft Firebreaks

Hard Break

Soft Break
Soft Firebreaks – Grazed Pasture
Soft Firebreaks – Crop Residue

MAKE IT BLACK!!!!
Soft Firebreaks – Mowed Firebreaks
Soft Firebreaks – Mowed Firebreaks
Soft Firebreaks – Mowed Firebreaks
Soft Firebreaks – Mowed Firebreaks
Soft Firebreaks – Mowed Firebreaks
Soft Firebreaks – Mowed Firebreaks

Early Spring
Soft Firebreaks – Mowed Firebreaks

Mid Spring
Soft Firebreaks – Mowed Firebreaks

Late Spring
Primary Soft Firebreak Function
Poor ‘Hard’ Fire Break
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Mowing Equipment
Soft Firebreaks – Wetlining
Soft Firebreaks – Wetlining
Mowed Breaks – When to mow?

- **Fall** after killing freeze through first heavy snows
  - Vegetation is dormant and brittle
  - Finely chopped easier to move with side delivery mowers
  - Light residue can blow away with fall/winter winds
  - Remaining residue can ‘settle’ over winter
  - Frozen ground easy to travel over

- **Early spring** after snow melt, ground frozen, before green up
  - Vegetation still dormant and brittle
  - Vegetation may not blow off w/wind
  - Ground may still be frozen

- **Green** heavy vegetation
  - Tough on mowers
  - Requires more power to cut and move residue
  - Soft ground
Soft Firebreaks – When to Mow??
Firebreaks – Design and Installation

- Firebreaks should be placed with several factors in mind
  - Equipment on Hand
  - Escape Routes / Safety Zones
  - Barriers and Entrapment
  - Fuel Load
  - Expected ground Conditions on Day-of-Burn
  - Probable Day-of-Burn Factors
  - Ignition Plan and Smoke Management
Firebreaks - Design

Headfire or Backfire line?
Firebreaks - Design
Firebreaks - Design

> 40’ flamemength

Firebreaks = Opportunity to ‘catch’ fire in Some situations

No persons between fence and fire

| 4’ fence

18’ Mowed Firebreak

wind
Firebreaks - Design
Firebreaks - Design
Firebreaks - Design
Firebreaks – Recognizing Opportunity
Firebreaks – Recognizing Opportunity
Firebreaks – Recognizing Opportunity
Partners

- Bureau of Indian Affairs
- Day County Conservation District
- Deuel County Extension Service
- Ducks Unlimited
- Ecosun Prairie Farms
- Minnesota Department of Natural Resources
- National Fish and Wildlife Foundation
- National Park Service
- National Resources Conservation Service
- Northern Prairies Land Trust
- Pheasants Forever
- Private Landowners

- Sisseton-Wahpeton Oyate
- South Dakota Department of Agriculture – Wildland Fire Suppression
- South Dakota Association of Conservation Districts
- South Dakota Department of Game, Fish and Parks
- South Dakota Fire Marshall’s Office
- South Dakota Grassland Coalition
- South Dakota State University
- The Nature Conservancy
- Upper Big Sioux Watershed Project
- U.S. Fish and Wildlife Service
Show pitchfork video
2:15-3 min
• Show pitchfork video
• Show USFWS ring fire video
Hazards
Fence Material

Bad Fence
Fence Material/Structures

Creosote Fence Post

Deer Stands
Sometimes you want them to burn
Sometimes you don’t
Trees

Standing trees near fire line
Notice the torching mid trunk.
Garbage Pits

Gas and oil cans.
Garbage Pits

Problems associated with pits
Cars

Junk Cars in the unit
Cars

Vehicles on the Fire Line – curious neighbors
Cars

Ties up man power and equipment, creates safety hazard
ATVs
Wildlife

They can burn!
Wildlife

Badger Holes
Wildlife

Pheasants
People

“wanderer’s” or “Lookie Loo’s”
Careless crew members
Poles can burn and heavy smoke can create arching in lines
Traffic and Roads

They are watching the fire, not the road.
Fire Tools and Resources
The minimum “Must have” Resources

• Needed Equipment
  – Some sort of COMMUNICATION SYSTEM
  – Some sort of RELIABLE water source
  – Multiple people to help
  – Drip torch
  – Lighters
  – Extra torch fuel
  – Pump cans or bladder bags
  – Metal leaf rake
  – Non-flammable clothing / gear
What is “Necessary” Personal Protective Equipment

- Leather Boots
- Jeans (Cotton)
- Long Sleeve Shirt (Cotton)
- Eye protection (Sunglasses)
- Leather gloves (no holes in the fingers)
- NOMEX fire resistant clothing is preferred
  - Nomex Pants
  - Nomex Shirt
  - Shrouds (head neck protection)
What should you “NOT” wear

- Synthetic material clothing
- Tennis shoes
- Short sleeve T-shirts
- Cotton or synthetic gloves
Class Test - Who’s Ready to Burn?

– Pick one of these guys
Extra but “NOT” Necessary

• Additional Equipment
  – Kestrel Weather Kit
  – Mechanical (electric/gas) pump units
  – Multiple drip torches
  – Radios
Equipment