

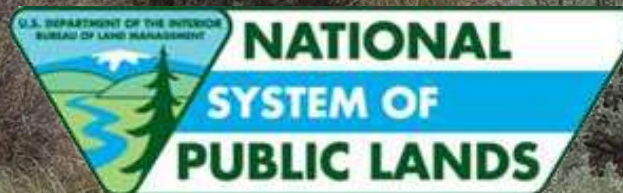
Seeding Wyoming Big Sagebrush in the Northern Great Basin

Robert D. Cox¹, Mike Pellant², Nancy L. Shaw³

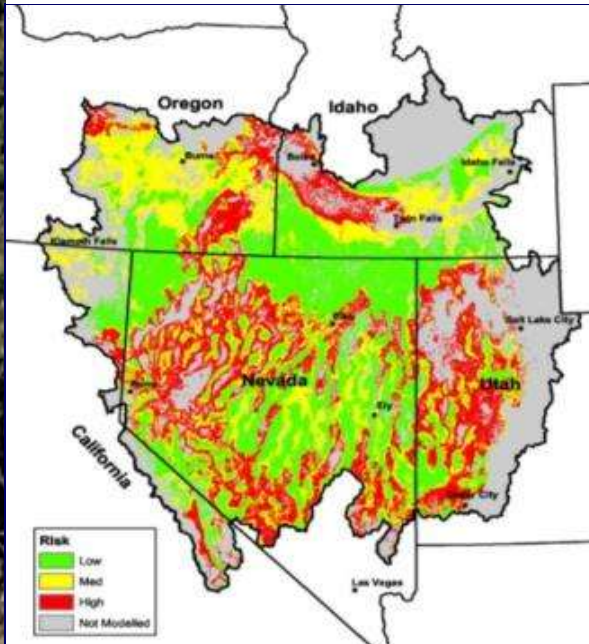
¹Texas Tech University, Lubbock, TX

²USDI Bureau of Land Management, Boise, ID

³USDA Forest Service Rocky Mountain Research Station, Boise, ID

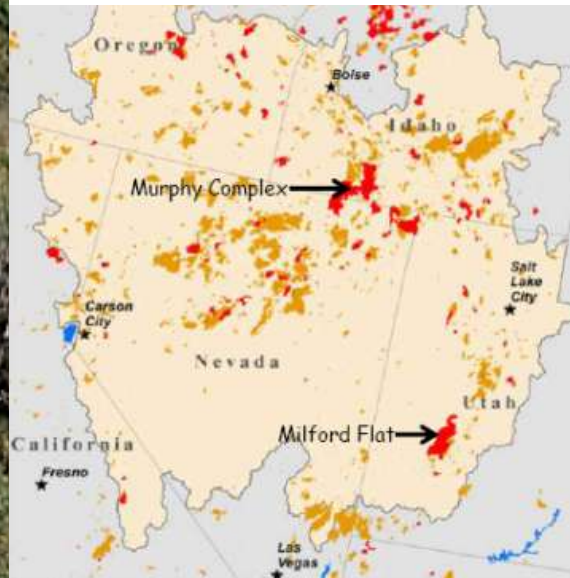


Cheatgrass risk assessment



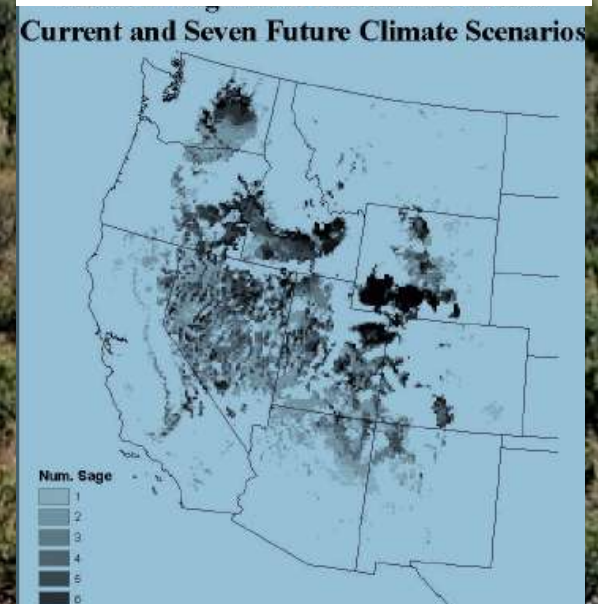
Wisdom et al. 2005

Wildfires 1990 - 2007



2007: 11,000km²
1990-2007: 68,000
km²

Areas of sagebrush persistence across current and 7 future climate scenarios



Neilson et al. 2005

Artemisia tridentata spp. *wyomingensis*

Wyoming Big Sagebrush

Seed Details.....

- 5.5 million seeds/kg
- Numerous seeds produced
- Generally short-lived seed bank
- Establishment erratic
- Seed can be maintained in storage
 - Clean to high purity, low moisture content (<10%)
 - Sealed container
 - 30% rh., -20°C
- Requires
 - Surface seeding
 - Good soil-seed contact



Drill Seeding Studies

Objectives

- Establish mixed communities
- Improve sagebrush establishment
- Develop forb seeding technology
- Drill comparison
 - > Reduce surface disturbance
 - > Conserve residual natives and biological soil crusts
 - > Minimize *B. tectorum*
- Examine monitoring protocols
- Evaluate grazing impacts



DRILLS

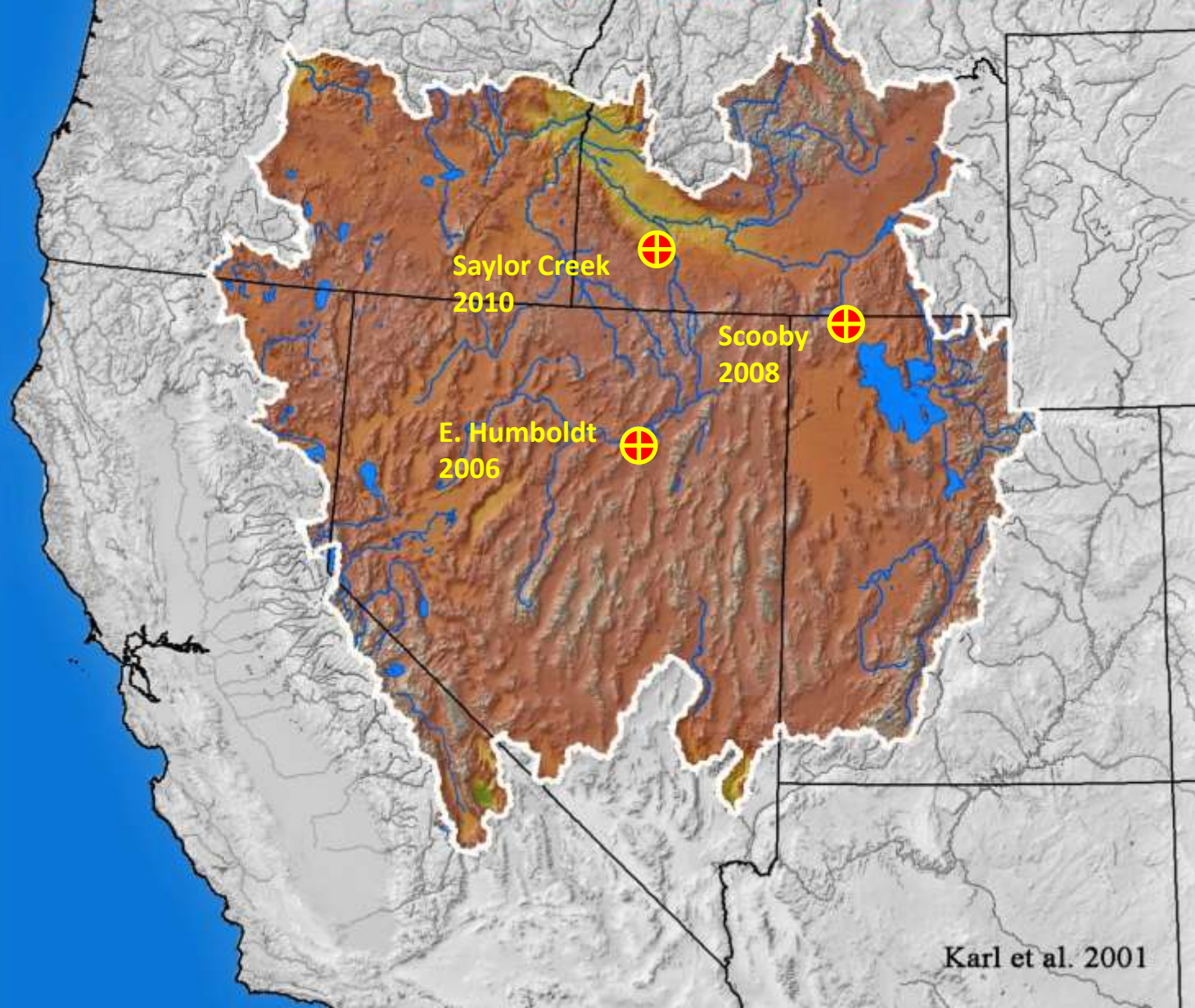
Rangeland drill



Minimum till drill



GREAT BASIN



Karl et al. 2001

GREAT BASIN

E. Humboldt 2006



Karl et al. 2001



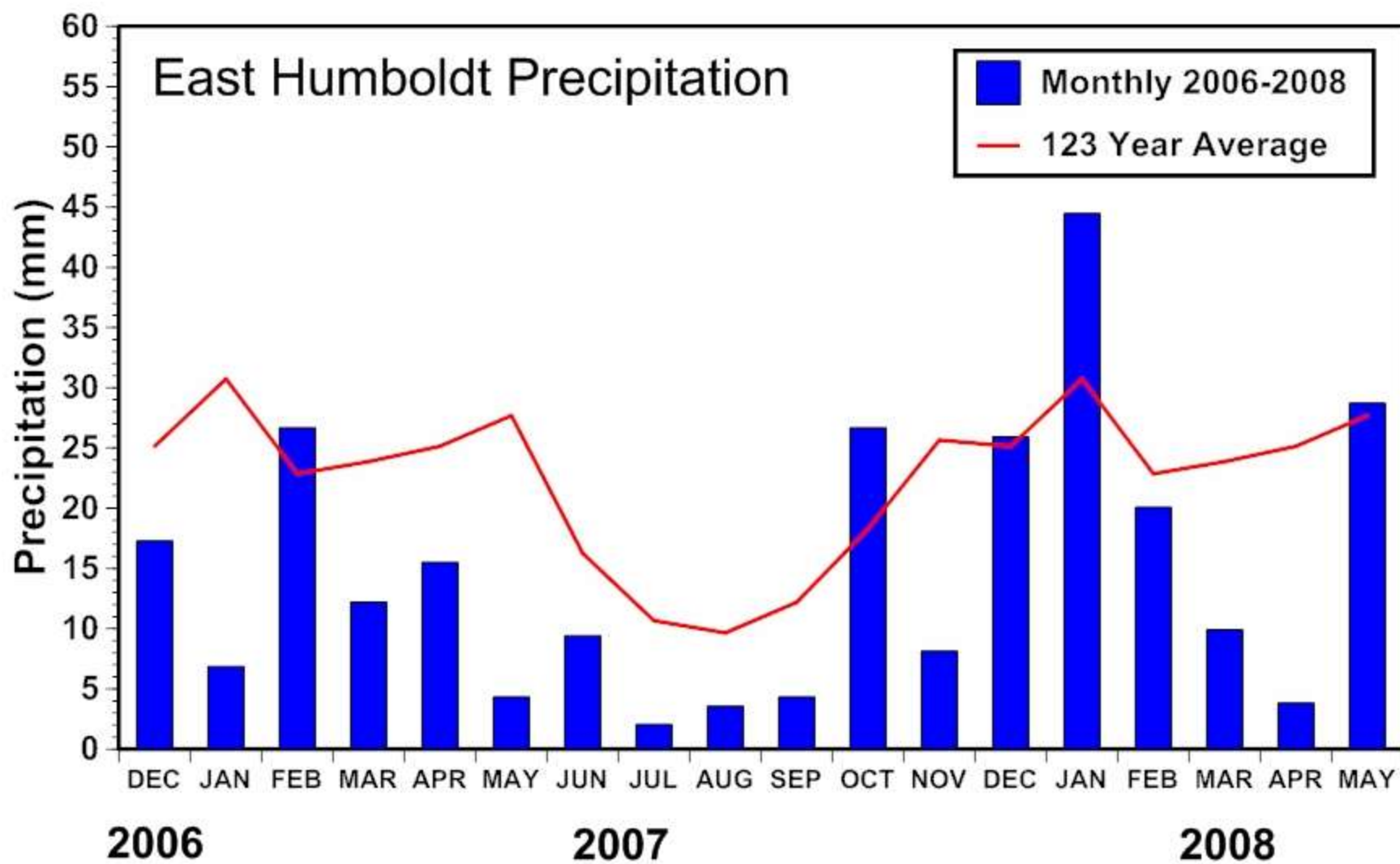
East Humboldt Site, Elko Co., NV

- Burned August 2006
- Seeded October 2006
- Low seeding rate is 75% of BLM recommended
- High seeding rate is 125% of BLM recommended

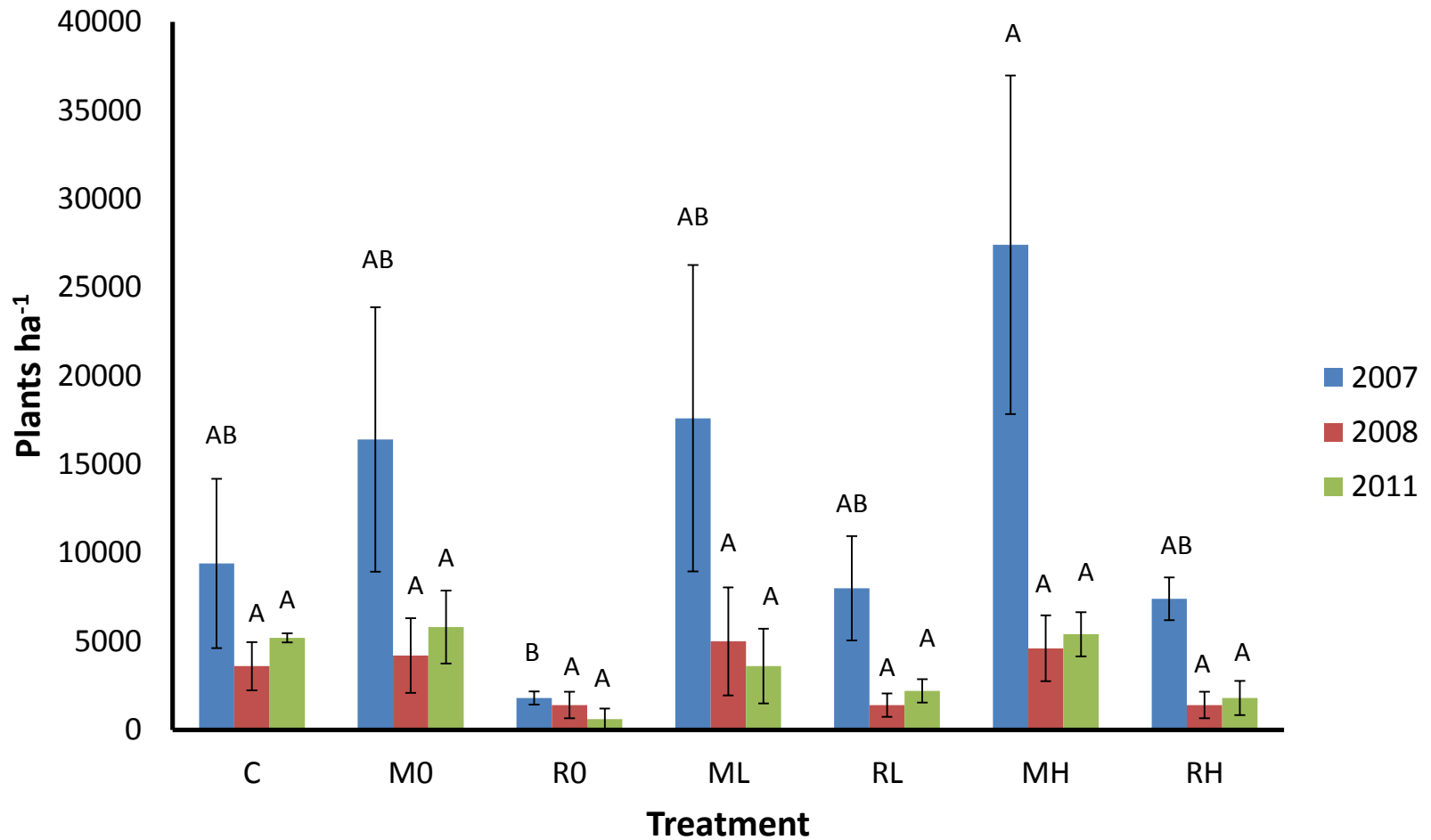
Drill	Seeding Rate	Code
No Drill	0	C
Minimum-Till	0	M0
	Low	ML
	High	MH
Rangeland	0	R0
	Low	RL
	High	RH

Elko Seeding Mix Species	Seeding Rate (PLS m ⁻²)	
	Low	High
<i>Broadcast mix</i>		
Wyoming big sagebrush	9.5	15.3
Rubber rabbitbrush	10.2	17.3
Eagle yarrow	105.9	171.1
Sandberg bluegrass	114.2	194.6
Rice hulls	-	-
<i>Total Broadcast</i>	<i>239.8</i>	<i>398.3</i>
<i>Drill Seeding mix</i>		
Fourwing saltbush	3.6	5.1
Blue flax	23.7	33.4
Munro's globemallow	29.8	41.2
Bluebunch wheatgrass	67.7	94.8
Bottlebrush squirreltail	5.9	8.2
Indian ricegrass	39.1	54.8
Rice hulls	-	-
<i>Total Drill</i>	<i>169.9</i>	<i>237.5</i>
Total Drill + Broadcast	409.6	635.8





East Humboldt Sagebrush Density 2007, 2008, 2011



East Humboldt 2009
Treatment: Rangeland High



2007



2008 – Treatment RH



2011 – Treatment ML



Joint Fire Science Study

Seeding Method	ARTR Rate	Other Rates	Code
Control (No Drill)	0	0	C
Minimum-till drill	0	0	M0
	1X	Std	MX
	5X	Std	M5X
	10X	Std	M10X
Min-till + Bcast	5X	Std	MfBC
Min-till + Winter Bcast	5X	Std	MwBC
Rangeland drill	0	0	R0
	1X	Std	RX
	5X	Std	R5X
	10X	Std	R10X
Rangeland + Bcast	5X	Std	RfBC
Rgland + Winter Bcast	5X	Std	RwBC

-Rangeland & Min-till

-3 Seeding rates

-Low

-Medium

-High

-Plus broadcast treatments

GREAT BASIN

Scooby 2008 ⊕

Karl et al. 2001



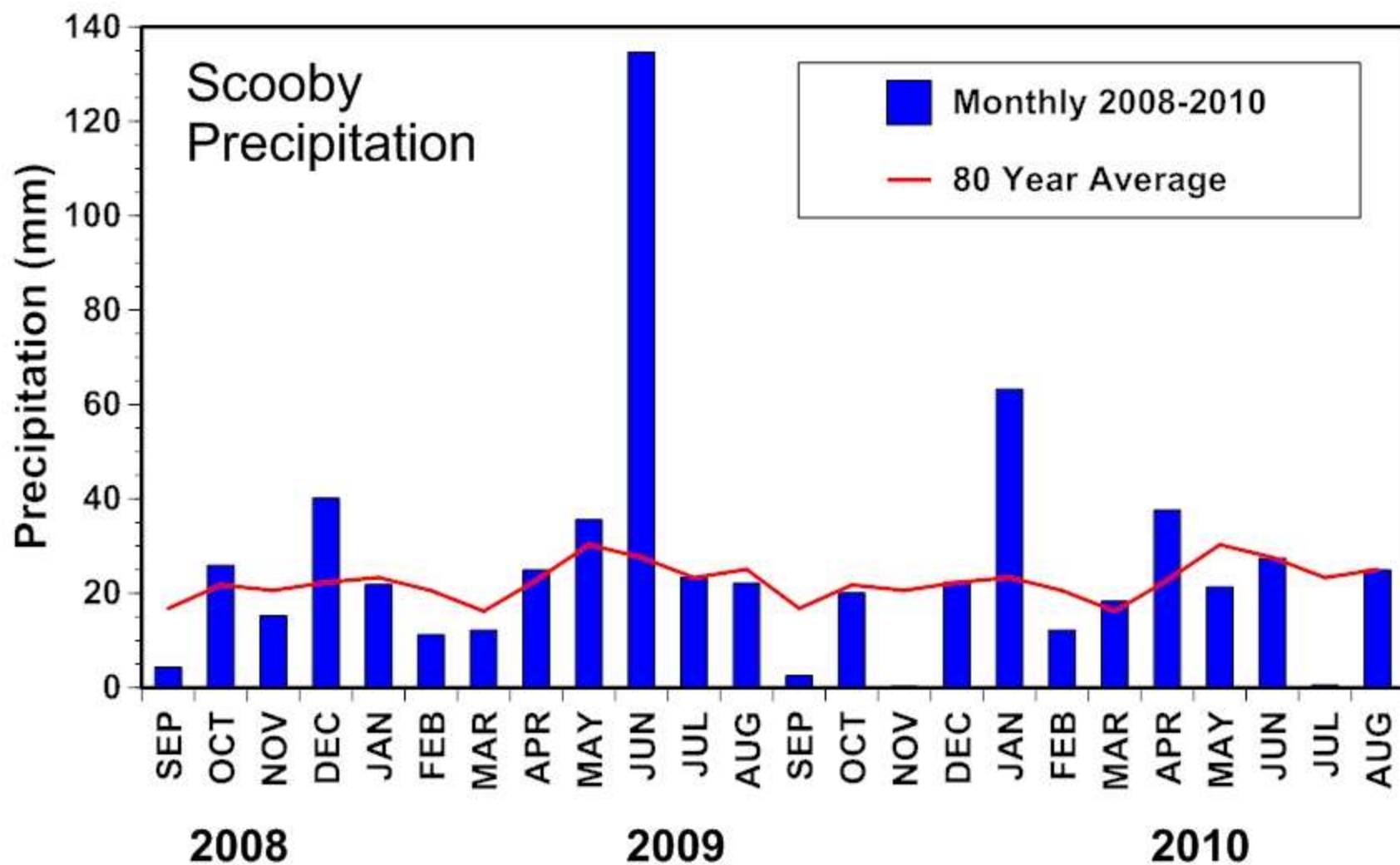
Scooby Seeding 2008



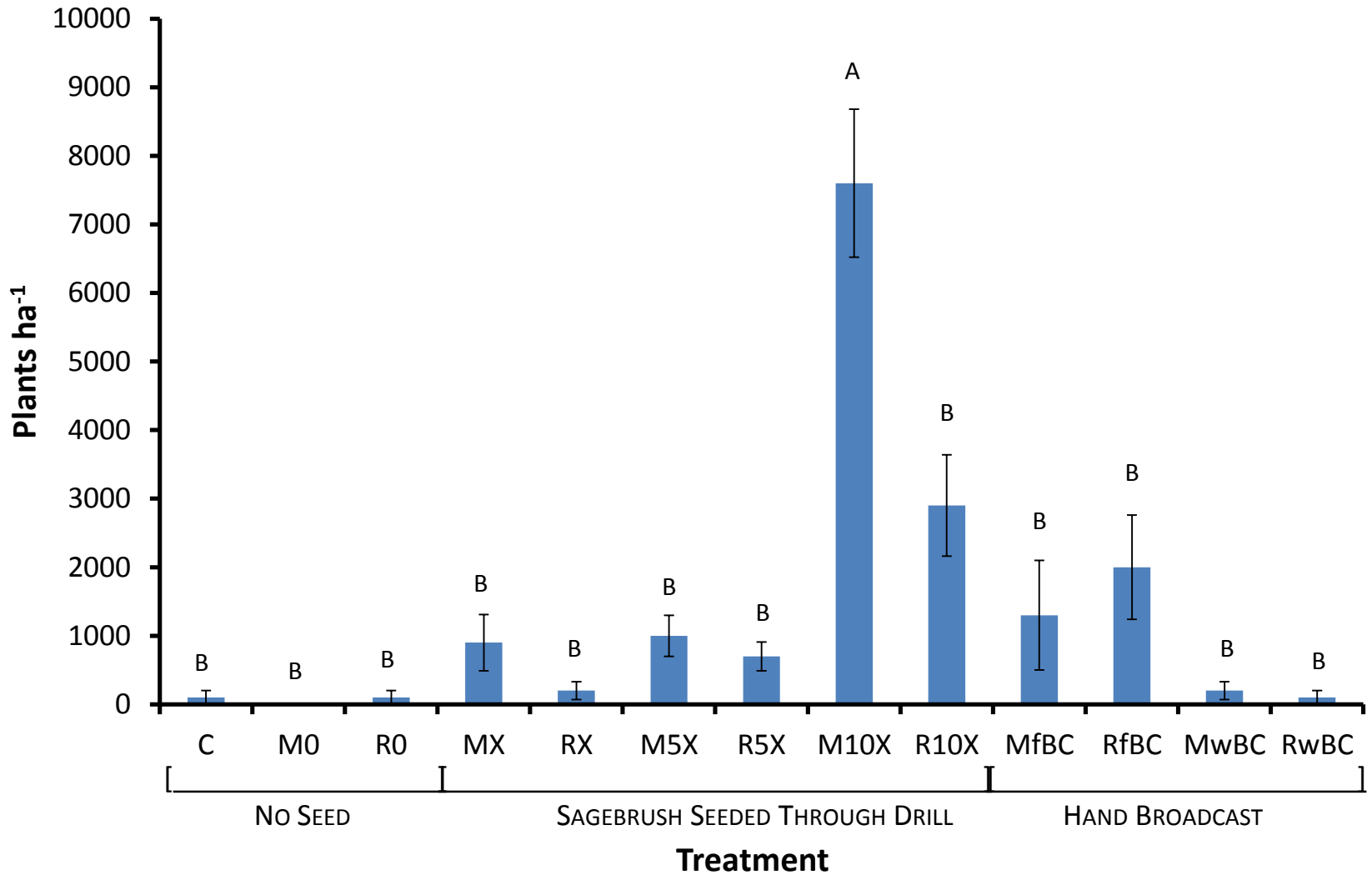
Scooby Site Species	Seeding Rate (PLS m ⁻²)		
	1x	5x	10x
Broadcast mix			
Wyoming big sagebrush	52	234	495
Rubber rabbitbrush	86	86	86
Eagle yarrow	100	100	100
Mtn Home Sandberg bluegrass	91	91	91
Royal Penstemon	76	76	76
Rice hulls	-	-	-
<i>Total Broadcast</i>	<i>405</i>	<i>587</i>	<i>848</i>
Drill Seeding mix			
Rimrock Indian ricegrass	51	51	51
Munro's globemallow	93	93	93
Anatone Bluebunch wheatgrass	67	67	67
Toe Jam Creek Bottlebrush squirreltail	47	47	47
Sulphur-flowered buckwheat	11	11	11
Rice hulls	-	-	-
<i>Total Drill</i>	<i>269</i>	<i>269</i>	<i>269</i>
Total Drill + Broadcast	674	856	1117

Scooby site
- Box Elder Co., UT

Sagebrush seed source:
- Southern Idaho



Scooby Sagebrush Density 2009 - 2010



Scooby Seeding 2010

2009



2010



2010 MX



2011 R10x



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Saylor Creek 2010 ⊕

Karl et al. 2001



Saylor Creek
2010

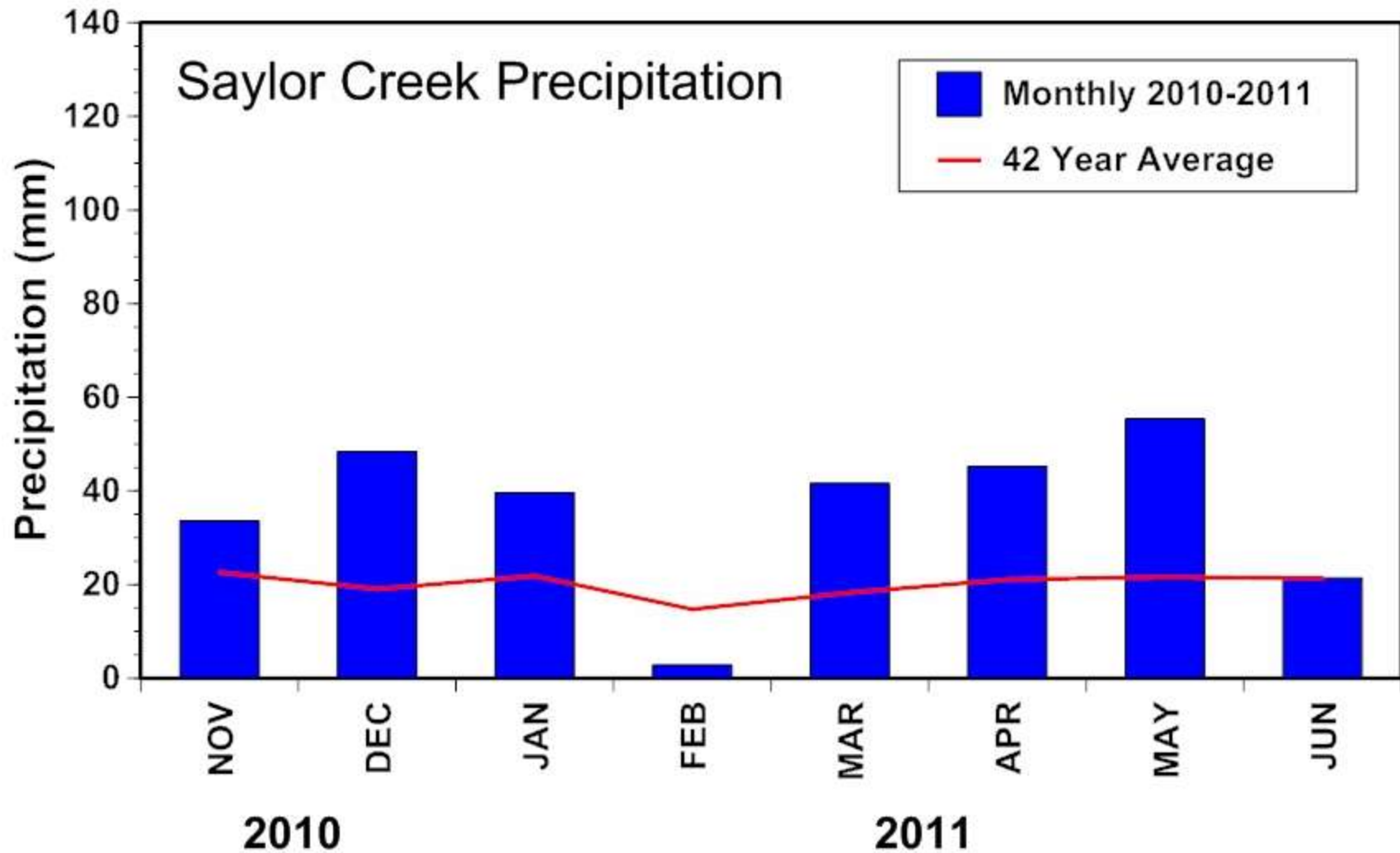


Saylor Creek Species	Seeding Rate (PLS m ⁻²)		
	1x	5x	10x
<i>Broadcast mix</i>			
Wyoming big sagebrush	50	250	500
Rubber rabbitbrush	85	85	85
Sandberg bluegrass	100	100	100
Eagle yarrow	100	100	100
Royal Penstemon	15	15	15
Rice hulls	-	-	-
<i>Total Broadcast</i>	<i>350</i>	<i>550</i>	<i>800</i>
<i>Drill Seeding mix</i>			
Anatone Bluebunch wheatgrass	60	60	60
Bottlebrush squirreltail	35	35	35
Rimrock Indian ricegrass	50	50	50
Needle and thread grass	20	20	20
Thurber's needlegrass	30	30	30
Basalt milkvetch	14	14	14
Munro's globemallow	40	40	40
Rice hulls	-	-	-
<i>Total Drill</i>	<i>249</i>	<i>249</i>	<i>249</i>
Total Drill + Broadcast	599	799	1049

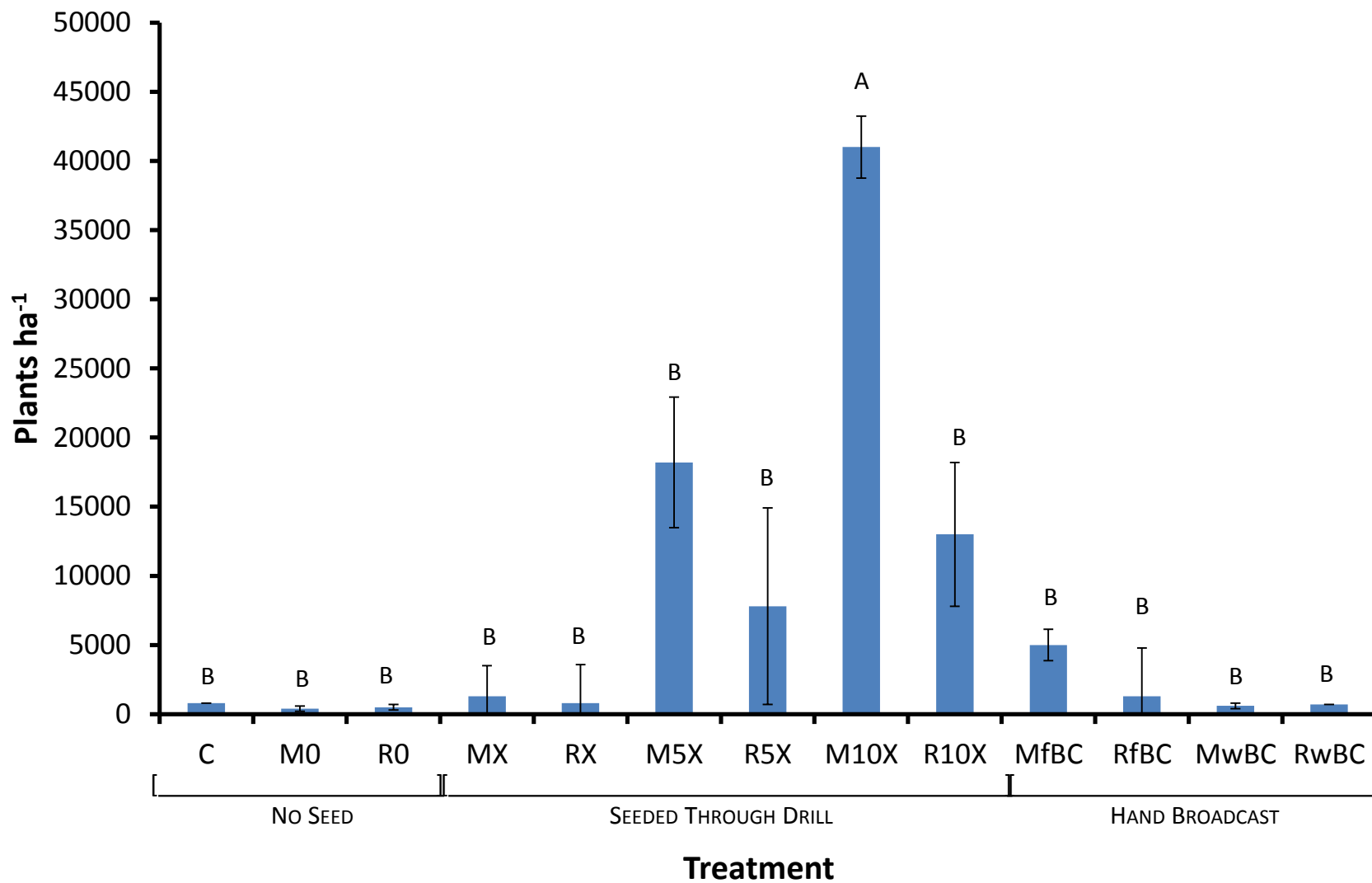


Saylor Creek site
- Elmore Co., ID

Sagebrush seed source:
- Power Co., ID (4560 ft)



Saylor Creek Sagebrush Density 2011





Saylor Creek
2011

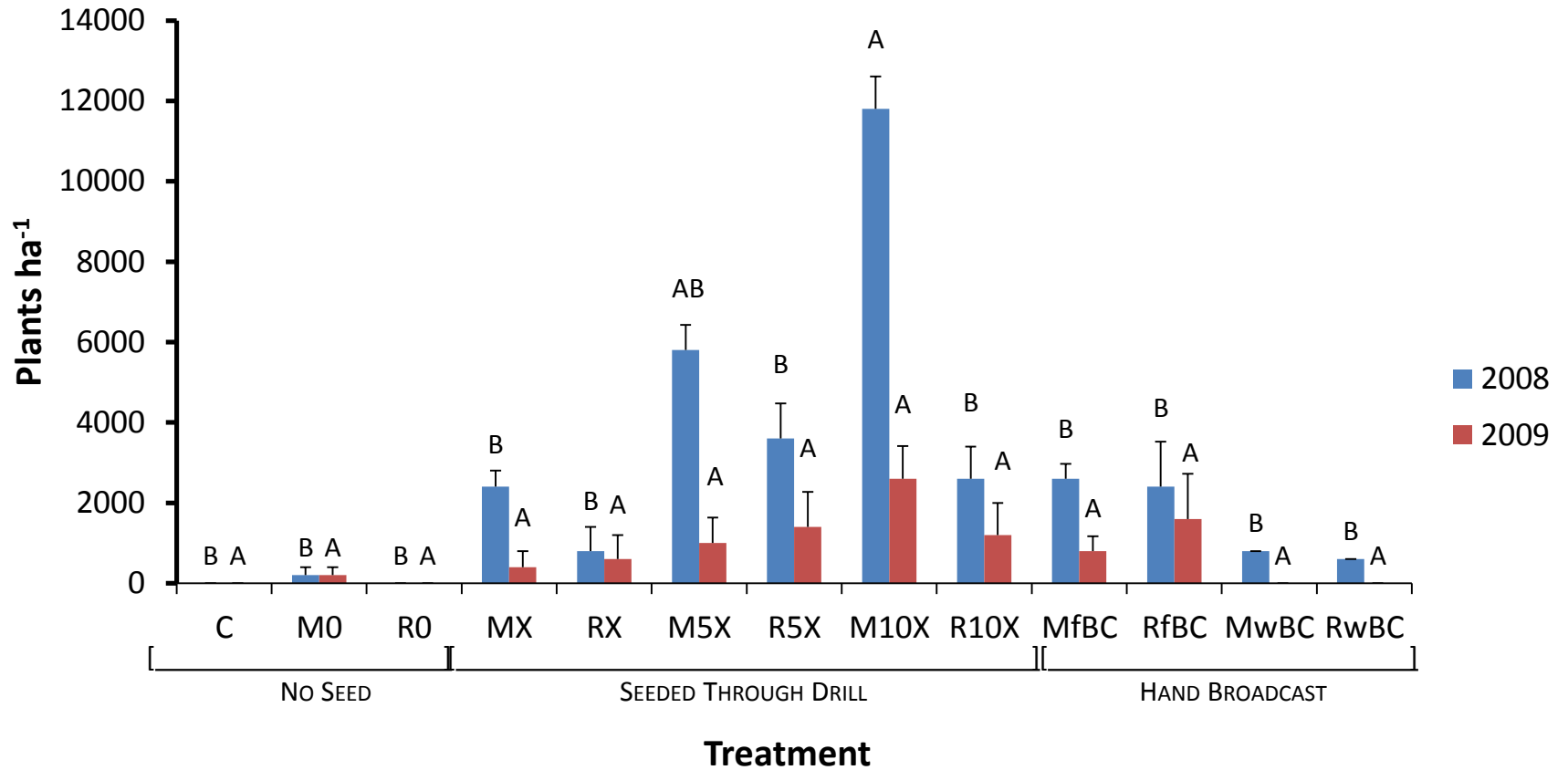
Conclusions

- ❑ Precipitation distribution and amount critical
- ❑ During the first year, Wyoming big sagebrush emergence tended to be greater when seeded with the minimum-till drill
- ❑ Wyoming big sagebrush density tended to increase with higher seeding rates, regardless of drill type
- ❑ At Saylor Creek and Scooby, seeding at the high rate with the minimum-till drill was more effective than broadcast seeding.

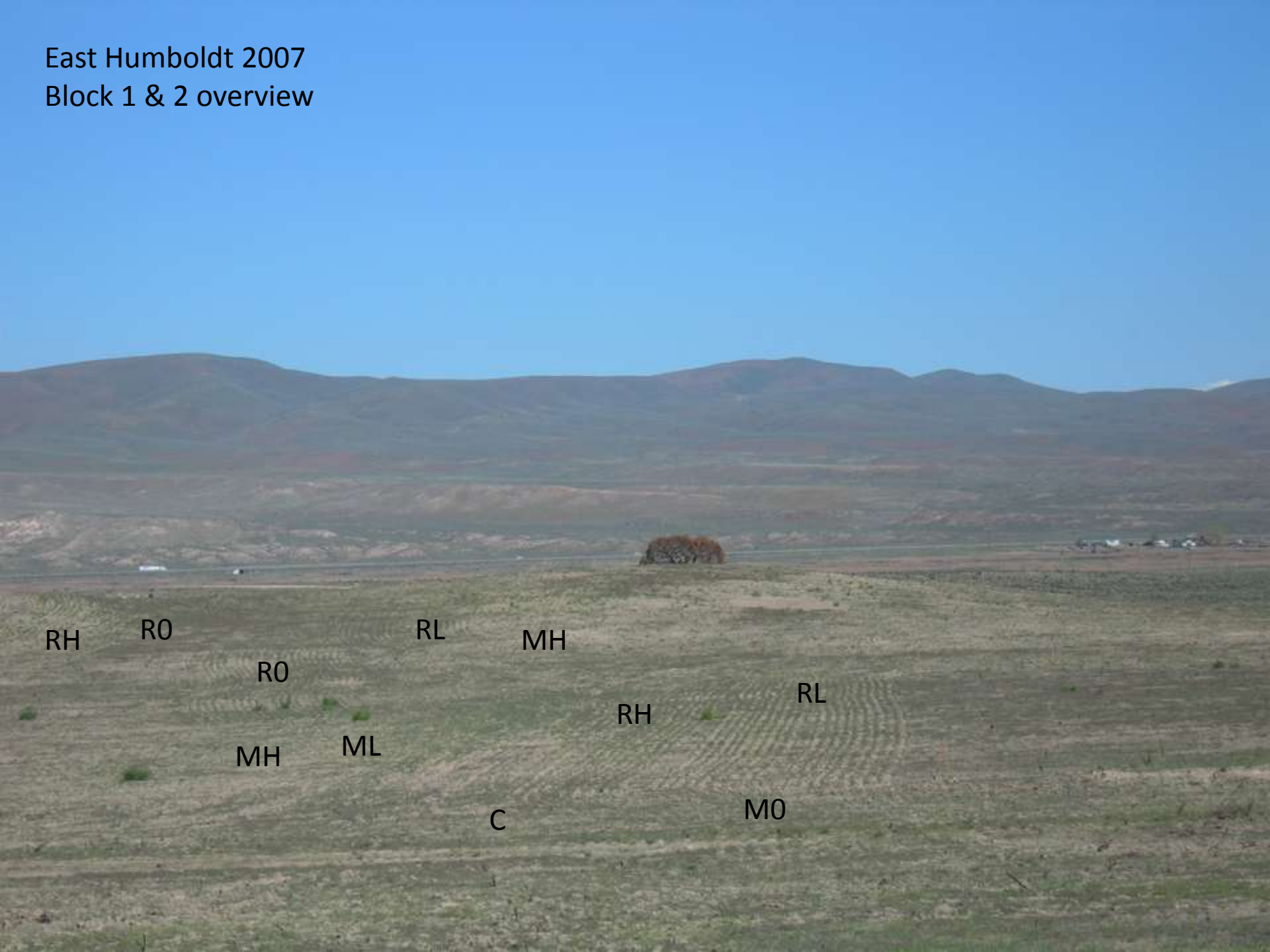
Acknowledgments

- Joint Fire Sciences Program
- USDI Great Basin Restoration Initiative
- USDI BLM Elko, NV; Salt Lake City, UT; Boise, ID
- DOD Mountain Home Air Force Base
- Nevada Department of Wildlife
- USDA NRCS Aberdeen Plant Materials Center
- USFS RMRS Great Basin Native Plant Selection and Increase Project

Mt. Home Sagebrush Density 2008 - 2009



East Humboldt 2007
Block 1 & 2 overview



East Humboldt 2007

Treatment: Control



Scooby Site, Box Elder Co., UT (SW of Snowville, UT)

- Seeded November 2008

Drill	Drill Seed	Broadcast Seed	Code
Minimum-Till	No Seed	No Seed	M0
	Machine	Machine (standard rate)*	MStd
	Machine	Machine (5x standard rate)	M5x
	Machine	Machine (10x standard rate)	M10x
	Machine	Hand (Nov 2008, 5x standard rate)	M+BC5x
	Machine	Winter (Jan 2009, 5x standard rate)	M+wBC5x
Rangeland	No Seed	No Seed	R0
	Machine	Machine (standard rate)	RStd
	Machine	Machine (5x standard rate)	R5x
	Machine	Machine (10x standard rate)	R10x
	Machine	Hand (Nov 2008, 5x standard rate)	R+BC5x
	Machine	Winter (Jan 2009, 5x standard rate)	R+wBC5x
No Drill	No Seed	No Seed	C

* Standard, 5x and 10x refer to the concentration of ARTR seed found in that broadcast mix

Scooby Treatments

Seeding Method	Sagebrush Rate	Other Species Rate	Code
Control (No Drill)	0	0	C
Minimum-till drill	0	0	M0
	1X	Standard	MX
	5X	Standard	M5X
	10X	Standard	M10X
Minimum-till + Broadcast	5X	Standard	MfBC
Minimum-till + Winter Broadcast	5X	Standard	MwBC
Rangeland drill	0	0	R0
	1X	Standard	RX
	5X	Standard	R5X
	10X	Standard	R10X
Rangeland + Broadcast	5X	Standard	RfBC
Rangeland + Winter Broadcast	5X	Standard	RwBC

Saylor Creek Treatments

Seeding Method	Sagebrush Rate	Other Species Rate	Code
Control (No Drill)	0	0	C
Minimum-till drill	0	0	M0
	1X	Standard	MX
	5X	Standard	M5X
	10X	Standard	M10X
Minimum-till + Broadcast	5X	Standard	MfBC
Minimum-till + Winter Broadcast	5X	Standard	MwBC
Rangeland drill	0	0	R0
	1X	Standard	RX
	5X	Standard	R5X
	10X	Standard	R10X
Rangeland + Broadcast	5X	Standard	RfBC
Rangeland + Winter Broadcast	5X	Standard	RwBC

Saylor Creek site, Elmore Co., ID (SW of Snowville, UT)

- Seeded October 2010

Drill	Drill Seed	Broadcast Seed	Code
No Drill	No Seed	No Seed	C
Minimum-Till	No Seed	No Seed	M0
	Machine	Machine (standard rate)*	MStd
	Machine	Machine (5x standard rate)	M5x
	Machine	Machine (10x standard rate)	M10x
	Machine	Hand (Nov 2008, 5x standard rate)	M+BC5x
	Machine	Winter (Jan 2009, 5x standard rate)	M+wBC5x
	Machine	Machine	M5x+D**
Rangeland	No Seed	No Seed	R0
	Machine	Machine (standard rate)	RStd
	Machine	Machine (5x standard rate)	R5x
	Machine	Machine (10x standard rate)	R10x
	Machine	Hand (Nov 2008, 5x standard rate)	R+BC5x
	Machine	Winter (Jan 2009, 5x standard rate)	R+wBC5x

* Standard, 5x and 10x refer to the concentration of ARTR seed found in that broadcast mix

** Extra depth of drill furrow applied to drill mix species

