

# UNDERSTANDING HOW SEASONALITY AND SHIFTS IN SPECIES COMPOSITION IMPACT EMISSION ESTIMATES IN SEMI-ARID ECOSYSTEMS

AARON SPARKS

MAJOR ADVISOR  
DR. ALISTAIR M.S. SMITH

# Emission factor ( $EF_x$ )

- *What is it?*

$$EF_x = \frac{\text{mass gas species 'x' (g)}}{\text{mass fuel combusted (kg)}}$$

- *Why is it important?*

Total gas emissions =

$$\begin{aligned} & A \quad (\text{area burned}) \\ & \times B \quad (\text{fuel load}) \\ & \times b \quad (\text{combustion completeness}) \\ & \times EF_x \quad (\text{emission factor}) \end{aligned}$$

# Objectives

- (i) determine impacts of seasonality on emission factors of major carbonaceous and nitrogenous gas species \*most studies look at one point in time (i.e. peak burn point in season)
- (ii) determine impacts of shifting vegetation species composition (via replacement of native with invasive species) that can alter the fire regime (including gas emission seasonality and combustion efficiency).

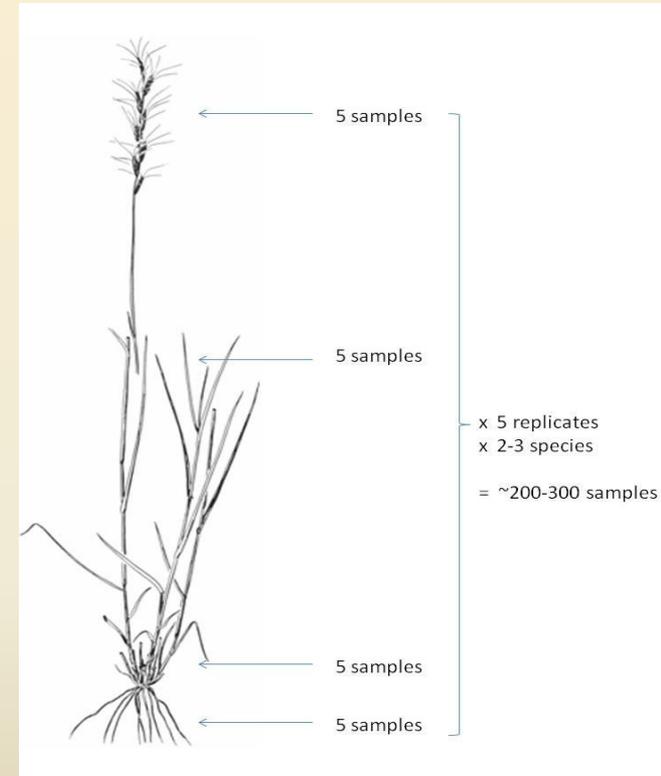
# Methods

## Study Area: Columbia National Wildlife Refuge

- *Artemisia tridentata* (big sagebrush)
- *Pseudoroegneria spicata* (bluebunch wheatgrass)
- *Poa secunda* (Sandberg bluegrass)
- *Bromus tectorum* (cheatgrass)

# Methods

- Collect three replicate samples of each species once per month through burning season (approx. April-October)
  - 1<sup>st</sup> sample: Fuel to be burned at 'field' moisture content
  - 2<sup>nd</sup> sample: Fuel to be burned at a set moisture content
  - 3<sup>rd</sup> sample: Fuel for C/N content (%)
- Burn samples in new burn lab!



# Expected Results

- Seasonal moisture- and C/N- content
- Seasonal gas emission factors
- Effect of species composition change on gas emissions

# Work so far...

- Collected ~300 C/N content samples from each species for July, August, and September
- Emission factor literature review in progress

# Research Timeline

Thesis Timeline

| Task                                | Year 1                  |    |      | Year 2 |    |      |
|-------------------------------------|-------------------------|----|------|--------|----|------|
|                                     | S1                      | S2 | Sum1 | S3     | S4 | Sum2 |
|                                     | Develop experiment plan |    |      |        |    |      |
| Conduct fieldwork & lab burns       |                         |    |      |        |    |      |
| Complete coursework                 |                         |    |      | •      |    |      |
| Collate historic veg. and burn maps |                         |    |      |        |    |      |
| Model potential emission changes    |                         |    |      |        |    |      |

S1-S4 = semester 1-4  
 Sum1 = summer 2013  
 Sum2 = summer 2014

