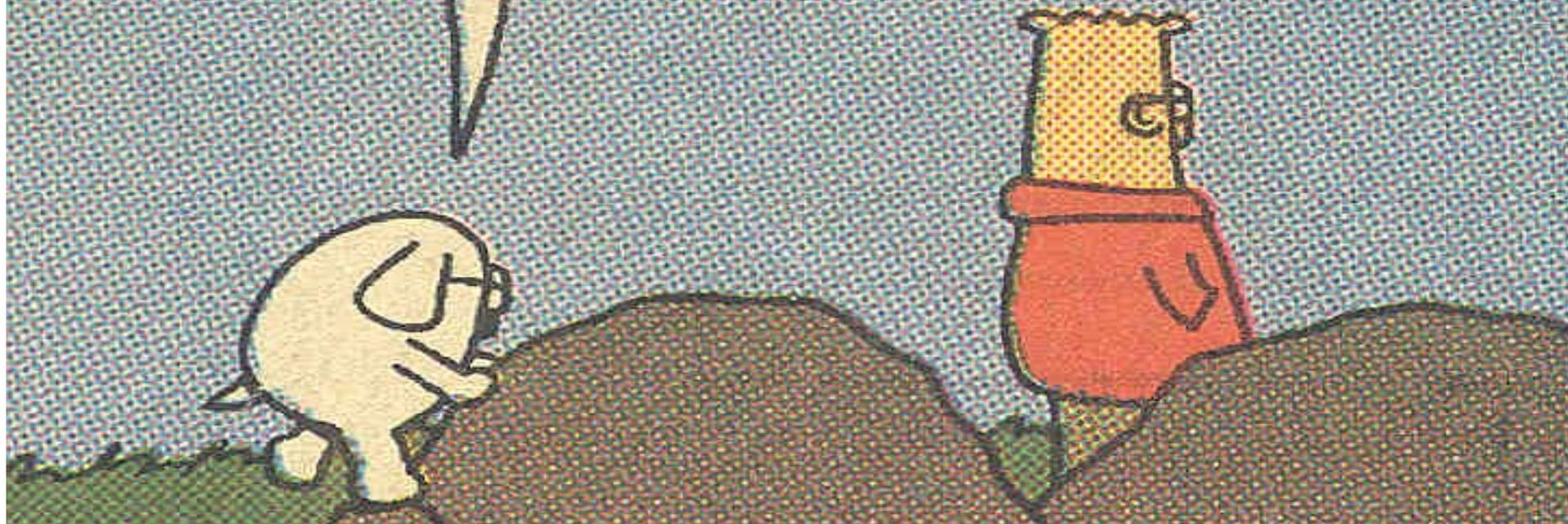


INFORMATION IS GUSHING  
TOWARD YOUR BRAIN  
LIKE A FIREHOSE AIMED  
AT A TEACUP.



# Applying the Technique: A five-step process



# Before beginning...

## Assemble Useful Resources

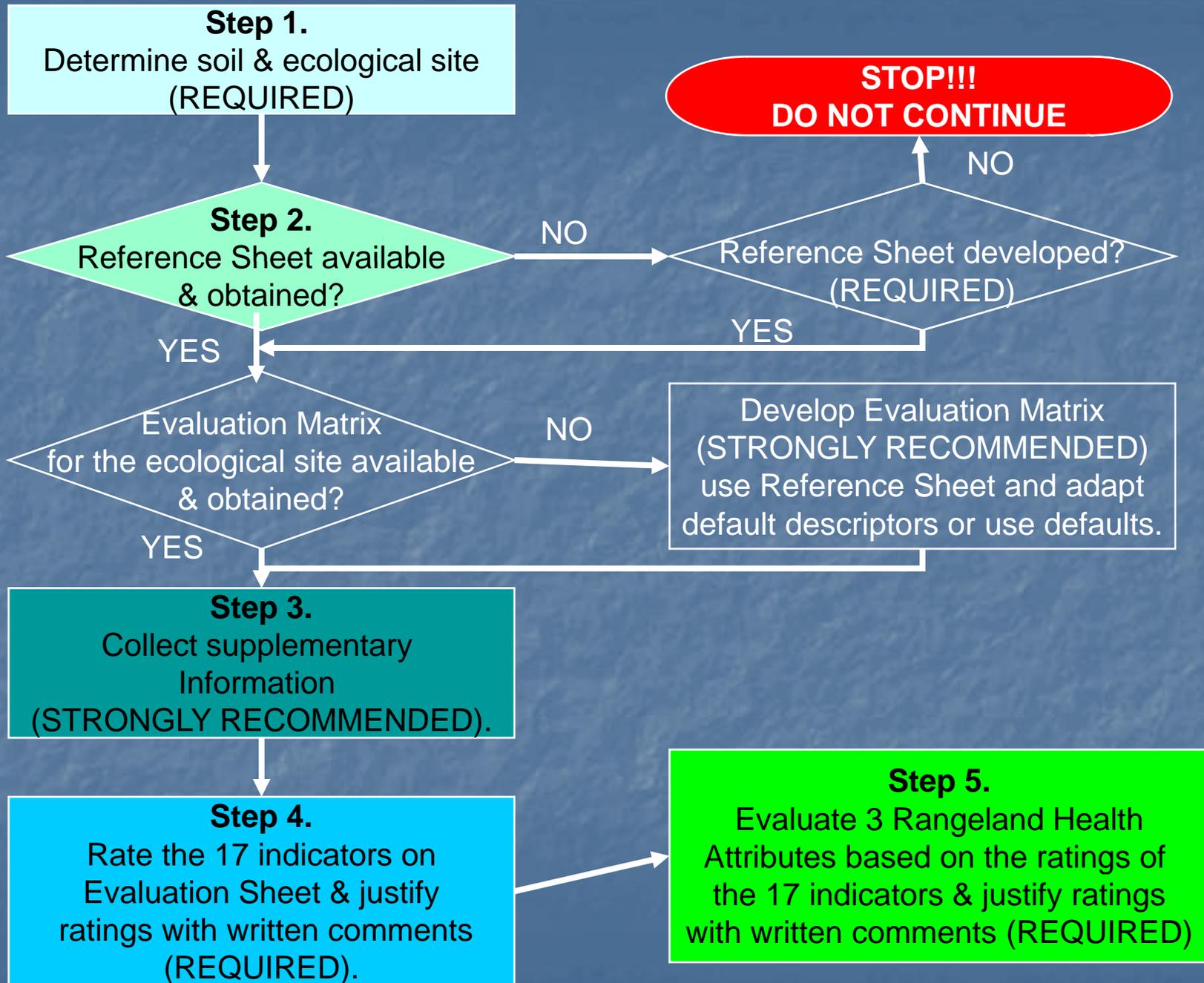
- Appendix 8—Checklist on page 122
- Maps or GIS themes
  - Topographic or Digital Elevation Map
  - Aerial Photography or Digital Ortho Qtr. Quad.
  - Soil Maps
- Soil Survey
- Species lists
- Ecological (Range) Site Descriptions

# Applying the Technique

## Five Steps

1. Determine Soil and Ecological Site at the evaluation area
2. Obtain or develop Reference Sheet
3. Collect Supplementary Information
4. Rate 17 indicators
5. Evaluate the 3 Rangeland Health Attributes

- In areas where soil surveys are unavailable, aerial photos, topographic maps, geologic maps, and local weather conditions can often be used to help decide whether ecological site descriptions from another area might be appropriate (table 3, page 20).



# Step 1 – Determine Soil and Ecological Site at Evaluation Area

- Slope, aspect, elevation, topographic position
- Verify soil
  - Soil pit
    - Surface Texture
    - Depth to restrictions
    - Diagnostic horizons
- Verify ecological site
  - Soil & Climate
- Document findings on
- Evaluation Sheet-
- Appendix 1 (page 66-69)



# Rangeland Health Evaluation Sheet

Aerial Photo: \_\_\_\_\_

Management Unit Randy Rancher  
(Allotment or pasture)

State NM

Office Las Cruces

Range/Ecol. Site Code: 042XB999NM

Ecological Site Name: Limy

Soil Map Unit/Component Name: Nickel gravelly fine sandy loam

Observers: Joe Smith, Jose Garcia and Thaddeus Jones Date: June 10, 2002

Location (description): Limy site two miles north of windmill in S.E. pasture

T. 11 S R. 23 W or \_\_\_\_\_ N. Lat. Or UTM E \_\_\_\_\_ m Position by GPS? Y / N No

UTM Zone \_\_\_\_\_, Datum \_\_\_\_\_  
Sec. 12, NE 1/4 \_\_\_\_\_ W. Long. N \_\_\_\_\_ m Photos taken? Y / N Yes

Size of evaluation area Evaluation area is approximately 3 ac. and represents entire ecological site in this pasture

## Soil / site verification:

Range/Ecol. Site Descr., Soil Surv., and/or Ecol. Ref. Area:

Surface texture grfsl, grlfs, gl

Depth: very shallow \_\_, shallow \_\_, moderate \_\_, deep X

Type and depth of diagnostic horizons:

1. Calcic horizon w/in 20"

2. \_\_\_\_\_

Surf. Efferv.: none \_\_, v. slight \_\_, slight \_\_, strong X, violent \_\_

## Evaluation Area:

Surface texture gfsl

Depth: very shallow \_\_, shallow \_\_, moderate \_\_, deep X

Type and depth of diagnostic horizons:

3. \_\_\_\_\_ 1. Calcic Horizon at 15" 3. \_\_\_\_\_

4. \_\_\_\_\_ 2. \_\_\_\_\_ 4. \_\_\_\_\_

Surf. Efferv.: none \_\_, v. slight \_\_, slight \_\_, strong X, violent \_\_

Parent material Alluvium Slope 0-5% Elevation 4100 ft.

Topographic position toeslope Aspect south

Average annual precipitation 8-12 inches

Seasonal distribution Summer thunderstorms dominate

Recent weather (last 2 years) (1) drought \_\_, (2) normal X, or (3) wet \_\_\_\_.

Wildlife use, livestock use (intensity and season of allotted use), and recent disturbances: Wildlife use is dominated by pronghorn antelope in the winter. Livestock use was extremely heavy yearlong during the 1900-1930. Last 50 years, livestock use has been cow/calf moderate yearlong use.

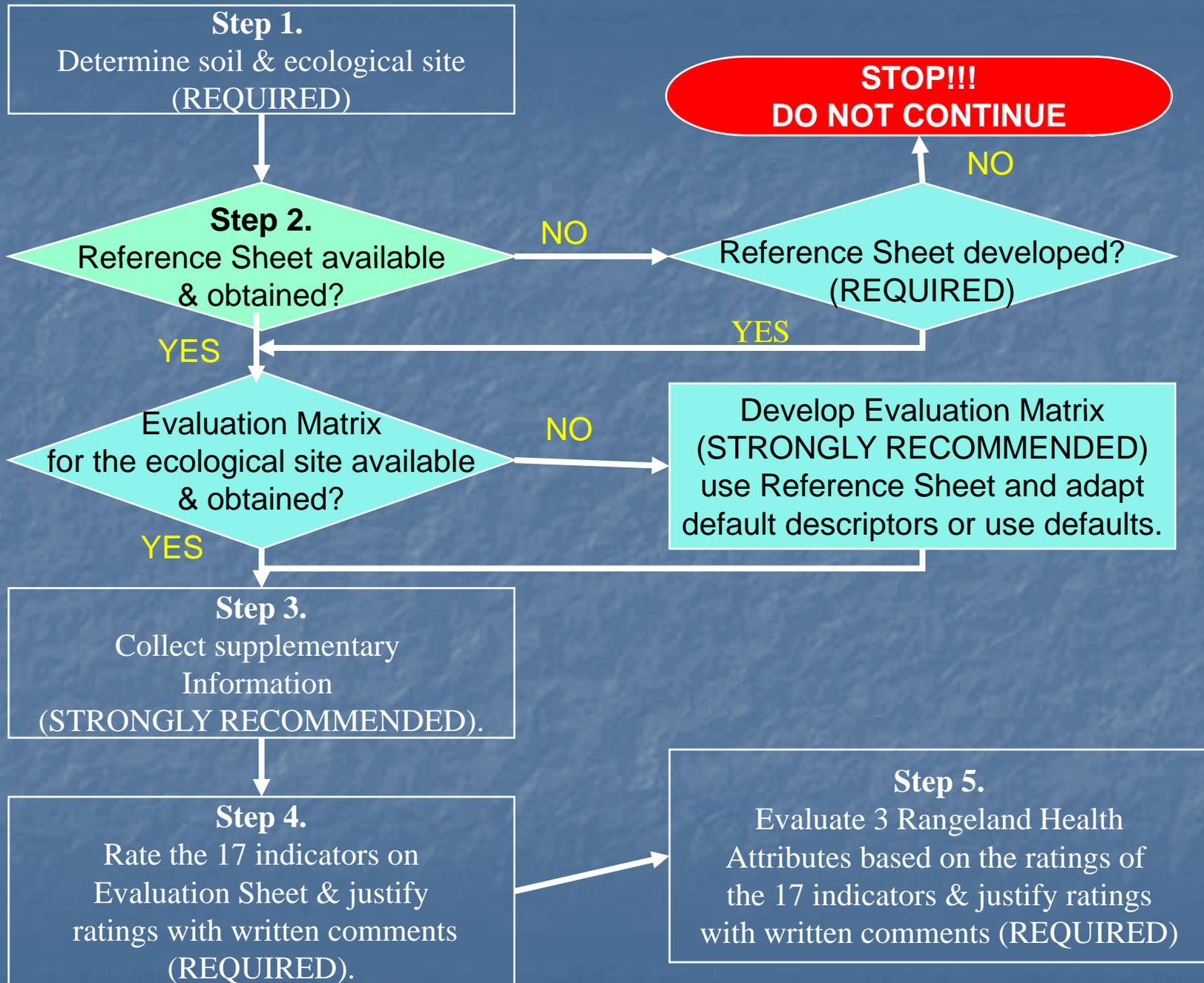
Off-site influences on evaluation area: None

Criteria used to select this particular evaluation area as REPRESENTATIVE (specific info. And factors considered; degree of "representativeness")

Area is located near a pasture key area. It is located in the center of the ecological and represents the typical amount of livestock, wildlife and recreational uses on this area. This ecological site dominates this pasture. The area is 3/4 of a mile from the closest water source.

Other remarks (continue on back if necessary)

Reference: (1) Ecological Reference Worksheet: Limy SD - 42B; Author: J. Christensen; Creation Date: 03/23/2002  
or (2) Other (e.g. name and date of ecological site description, locations of ecological reference area(s)) Limy Ecological Site 042XB999NM June 2001.



## Step 2 – Reference Sheet (Appendix 2-page 71)

- What is it?
  - Describes the expected variation for each of the 17 indicators
    - Incorporates variation among vegetation phases in a state that is resistant & resilient to disturbance (e.g., reference state)
  - Ecological site-specific
- Develop
  - Assemble resources (maps, data, etc.) & group of experts
  - Reach consensus on each indicator description
- Obtain
  - In future, from NRCS State Office or web at <http://plants.usda.gov/> & follow links to ESIS (Ecological Site Information System)

## Reference Sheet

**Author(s)/participant(s):** J. Christensen, B. Call, B. Bestelmeyer, R. Placker, D. Trujillo, L. Hauser, D. Coalson, P. Smith, & J. Herrick

**Contact for lead author:** \_\_jchristensen@web.com/334-556-7890\_\_ **Reference site used? Yes/No: No**

**Date:** 03/23/2002 **MLRA:** \_\_42\_\_ **Ecological Site:** \_\_Limy\_\_ This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community *cannot* be used to identify the ecological site.

**Indicators.** For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years for **each** community within the reference state, when appropriate & (3) cite data. Continue descriptions on separate sheet.

**1. Number and extent of rills:** *None*

**Page 73**

**2. Presence of water flow patterns:** *None, except following extremely high intensity storms, when short (less than 1 m) flow patterns may appear; minimal evidence of past or current soil deposition or erosion.*

**3. Number and height of erosional pedestals or terracettes:** *None*

**4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are *not* bare ground):** *20 – 30 % bare ground; bare patches should be less than 8-10 inch diameter; occasional 12 inch patches associated with shrubs. Larger bare patches also associated with ant mounds and rodent disturbances*

**5. Number of gullies and erosion associated with gullies:** *None*

**6. Extent of wind scoured, blowouts and/or depositional areas:** *None*

**7. Amount of litter movement (describe size and distance expected to travel):** *Minimal and short, associated with water flow patterns following extremely high intensity storms. Litter also may be moved during intense wind storms*

**8. Soil surface (top few mm) resistance to erosion (stability values are averages – most sites will show a range of values):***Stability class (Herrick et al. 2001) anticipated to be 5-6 at surface and subsurface under vegetation and 4-5 at surface and subsurface in the interspaces. These values need verification at reference sites.*

Appendix 6. Rangeland Health Indicator

State \_\_\_\_\_ Office \_\_\_\_\_

Authors: \_\_\_\_\_ Revision Date \_\_\_\_\_

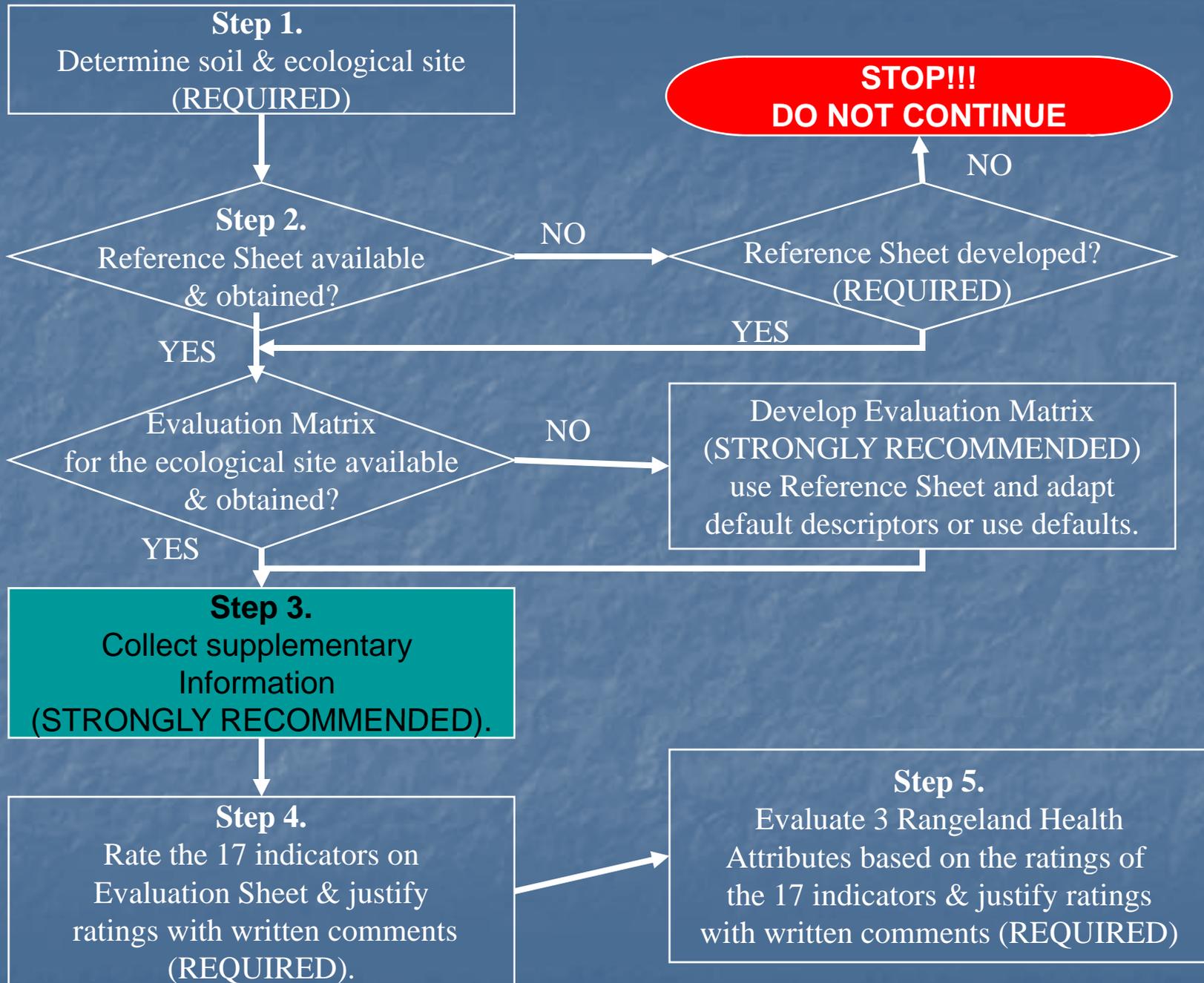
**Appendix 4, Page 81-87**

Fill in specific narratives for remaining four classes

Add text from Reference Sheet to None-to-Slight

Departure from Ecological Site Description/Ecological Reference Worksheet					
Indicator	Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to Slight
1. Rills*	_____	_____	_____	_____	Ecological Reference Worksheet: _____ _____ _____
Generic Descriptor	Rill formation is severe and well defined throughout most of the site.	Rill formation is moderately active and well defined throughout most of the site.	Active rill formation is slight at infrequent intervals; mostly in exposed areas.	No recent formation of rills; old rills have blunted or muted features.	Current or past formation of rills as expected for the site.
2. Water Flow Patterns *	_____	_____	_____	_____	Ecological Reference Worksheet: _____ _____ _____
Generic Descriptor	Water flow patterns extensive and numerous; unstable with active erosion; usually connected.	Water flow patterns more numerous and extensive than expected; deposition and cut areas common; occasionally connected.	Number and length of water flow patterns nearly match what is expected for the site; erosion is minor with some instability and deposition.	Number and length of water flow patterns match what is expected for the site; some evidence of minor erosion. Flow patterns are stable and short.	Matches what is expected for the site; minimal evidence of past or current soil deposition or erosion.
3. Pedestals and/or Terracettes	_____	_____	_____	_____	Ecological Reference Worksheet: _____ _____ _____
3. Pedestals and/or Terracettes Generic Descriptor	Abundant active pedestalling and numerous terracettes. Many rocks and plants are pedestaled; exposed plant roots are common.	Moderate active pedestalling; terracettes common. Some rocks and plants are pedestaled with occasional exposed roots.	Slight active pedestalling; most pedestals are in flow paths and interspaces and/or on exposed slopes. Occasional terracettes present.	Active pedestalling or terracette formation is rare; some evidence of past pedestal formation, especially in water flow patterns on exposed slopes.	Current or past evidence of pedestaled plants or rocks as expected for the site. Terracettes absent or uncommon.

\* Descriptions should be more specific than those listed in the General Example, if possible, and refer to the criteria included in the None to Slight description, which is based on the Ecological Reference Worksheet. See page \_\_ for an Ecological Reference Worksheet example.



# Step 3. Collect Supplementary Data

Appendix 3-  
page 77

## Functional/Structural Groups Worksheet

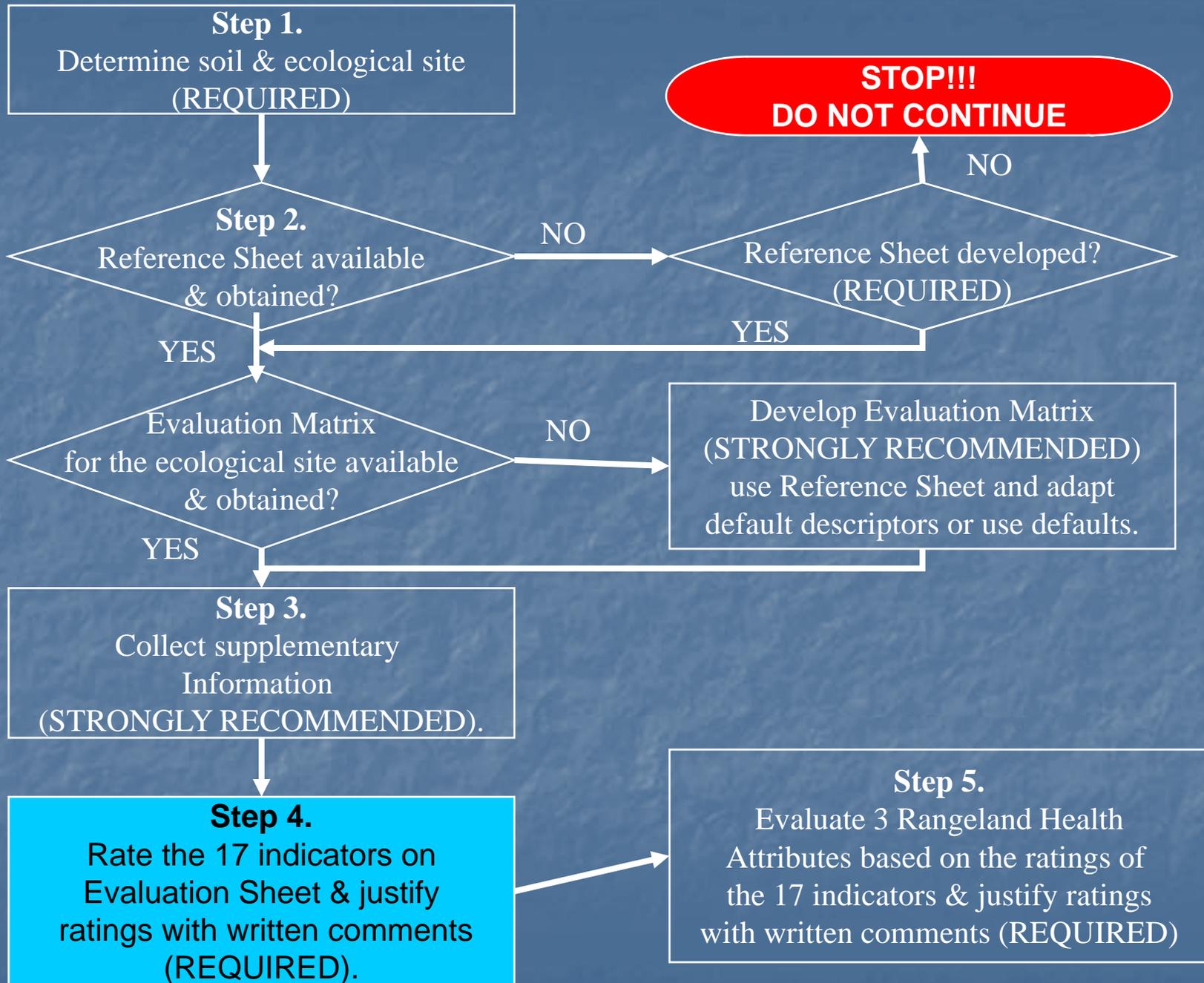
State TD Office Big Butte Ecological Site Loamy 10-14" PZ Site ID S-1  
 Observer(s) Long, Wide, High Date 8/8/00

Functional/Structural Groups			Species List for Functional/Structural Groups
Name	Potential <sup>1</sup>	Actual <sup>2</sup>	Plant Names
Annual Grasses	I	S	Cheatgrass, six weeks fescue
Short Perm. bunchgrasses	M	M	Sandberg bluegrass
Mid Perm. bunchgrasses	D	M	Thurbers needlegrass, bottlebrush squirreltail
Tall Perm. bunchgrass	M	I	Basin wildrye
Fl. grazing forb	M	I	Astragalus spp., Lupine
Deep lay. rooted forb	M	I	Hookers balsamroot, Comatium
Non resprouting shrub	D	D	Big sagebrush
Resprouting Shrubs	M	I	Green rabbitbrush, Gray Horsebush
Succulents	I	I	Prickly pear cactus
Biological Crust <sup>3</sup>	S	M	Lichen & Mosses

Indicate whether each "structural/functional group" is a Dominant (D) (roughly 41-100% composition), a Subdominant (S) (roughly 11-40% composition), a Miner Component (M) (roughly 3-10% composition), or a Trace Component (T) (<3 % composition) based on weight or cover composition in the area of interest (e.g., "Actual" column) relative to the "Potential" column derived from information found in the ecological site description and/or at the ecological reference area.

Biological Crust<sup>3</sup> dominance is evaluated solely on cover not composition by weight.

- Ecological Reference Areas
- Quantitative Data

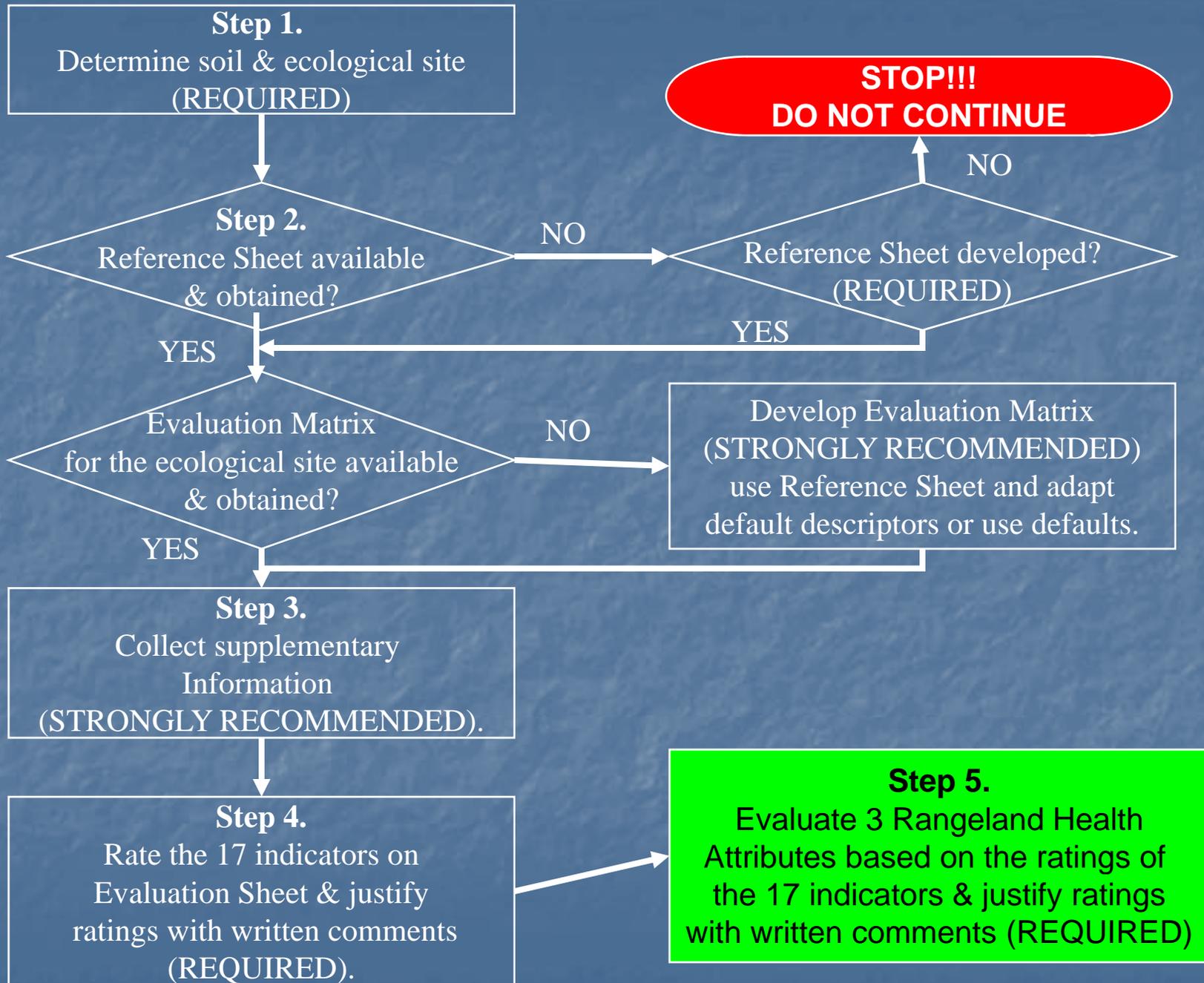


# Step 4 – Rate the 17 indicators

## Appendix 1- page 69

- Complete reconnaissance
- Use Evaluation Matrix
- Teams preferred
- Rate deviation:
  - None-to-Slight
  - Slight-to-Moderate
  - Moderate
  - Moderate-to-Extreme
  - Extreme-to-Total
- Record comments!!

Departure from Expected		Code	Instructions:
None to Slight.....		N-S	(1) Assign 17 indicator ratings. If indicator not present, rate None to Slight. (2) In the three grids below, write the indicator number in the appropriate column for each indicator that is applicable to the attribute. (3) Assign overall rating for each attribute based on preponderance of evidence. (4) Justify each attribute rating in writing.
Slight to Moderate.....		S-M	
Moderate.....		M	
Moderate to Extreme.....		M-E	
Extreme.....		E	
Indicator	Rating		Comments
1. Rills	S H		
	N-S		
2. Water-flow Patterns	S H		
	S-M		
3. Pedestals and/or terracettes	S H		
	S-M		Occasionally in flow patterns
4. Bare Ground _ 15 ____ %	S H		
	M		Normal is 3-5%. This area has 3-fold higher than expected
5. Gullies	S H		
	N-S		
6. Wind-scoured, blowouts, and/or deposition areas	S		
	N-S		
7. Litter movement	H		
	S-N		
8. Soil surface resistance to erosion	S H B		
	M		Expected should be 5-6, but we had a mean of 18 cells with 3.8
9. Soil Surface loss or degradation	S H B		
	S-M		
10. Plant community composition and distribution relative to infiltration and runoff	H		
	N-S		
11. Compaction layer	S H B		
	S-M		Some platy structure with roots passing horizontally for short distances < 1 inch
12. Functional/structural groups	B		
	M		We should expect several species in each F/S group but only have one species/group here. Also, red brome, an invasive exotic, is a subdominate
13. Plant mortality/decadence	B		
	N		
14. Litter amount	H B		
	N-S		
15. Annual production	B		
	M		Expected 1000 #/ac; have 400-600 #/ac here
16. Invasive/toxic plants	B		
	M-E		Red brome is subdominate and common at this site
17. Reproductive capability of perennial plants	B		
	N-		



# Step 5 – Rate Attributes

## Indicators of Soil/Site Stability

- Rills
- Water Flow Patterns
- Pedestals/Terracettes
- Bare Ground
- Gullies
- Wind Scour Areas
- Litter Movement
- Resistance to Erosion
- Loss of soil surface
- Plant/infiltration effects
- Compaction layer
- Functional/structural groups
- Plant mortality/decadence
- Litter Amount
- Annual Production
- Invasive Plants
- Reproductive Capability

# Step 5 – Rate Attributes

## Indicators of Hydrologic Function

- **Rills**
- **Water Flow Patterns**
- **Pedestals/Terracettes**
- **Bare Ground**
- **Gullies**
- Wind Scour Areas
- Litter Movement
- **Resistance to Erosion**
- **Loss of soil surface**
- **Plant/infiltration effects**
- **Compaction layer**
- Functional/structural groups
- Plant mortality/decadence
- **Litter Amount**
- Annual Production
- Invasive Plants
- Reproductive Capability

# Step 5 – Rate Attributes

## Indicators of **Biotic Integrity**

- Rills
- Water Flow Patterns
- Pedestals/Terracettes
- Bare Ground
- Gullies
- Wind Scour Areas
- Litter Movement
- **Resistance to Erosion**
- **Loss of soil surface**
- Plant/infiltration effects
- **Compaction layer**
- **Functional/structural groups**
- **Plant mortality/decadence**
- **Litter Amount**
- **Annual Production**
- **Invasive Plants**
- **Reproductive Capability**



# Exercise

1. Rate the nine **Biotic Integrity** indicators by filling out the appropriate column on the following Evaluation Sheet.
2. Evaluate (rate) the **Biotic Integrity** Attribute on the same Evaluation Sheet.

Ecological Reference Area for Loamy 10-12  
(Wyoming big sagebrush/bluebunch  
wheatgrass) ecological site



# Evaluation Area on Loamy 10-12 (Wyoming big sagebrush/bluebunch wheatgrass) ecological site



# Departure from Expected for the Nine Indicators of **Biotic Integrity**

#	Indicator	Rating
8.	Soil Resistance to Erosion	Moderate
9.	Soil Loss or Degradation	Slight to Moderate
11.	Compaction layer	Moderate
12.	Functional/structural groups	Moderate to Extreme
13.	Plant mortality/decadence	Moderate
14.	Litter Amount	Moderate
15.	Annual Production	Slight to Moderate
16.	Invasive Plants	Extreme to Total
17.	Reproductive Capability	Moderate to Extreme