

Background to Jonah Field Reclamation Criteria

As required by the Jonah Infill Drilling Project Record of Decision, the Jonah Interagency Mitigation and Reclamation Office (JIO) developed draft reclamation criteria to be used to measure reclamation success in the Jonah Field. These criteria are the result of an exhaustive review of existing data from a number of governmental and private sources, multiple site visits to other reclamation locations, study of the ecological status of the Jonah Field, and identifying reasonable expectations for vegetation growth. The public is invited to review these criteria and provide comments to the JIO at the address provided below.

As background, the ROD limited total surface disturbance to 46% of the Jonah Infill Drilling Project Area at any given point in time, or a maximum of 14,030 acres. To ensure equity between Operators, this disturbance limit is distributed on an operated-acreage basis. Additionally, cumulative surface disturbance is limited to 20,334 acres over the life of the project. To implement this strategy, the ROD defined reclamation objectives in two stages; “roll-over” and “final”.

“Roll-over” reclamation objectives are reached when desired plant species are present and in adequate abundance to ensure that over time the site will revert back to a functioning ecosystem. Reclamation that meets these objectives would result in a one-to-one credit against the total surface disturbance limit of 14,030 acres. By implementing this strategy, 6,304 additional acres of disturbance are potentially available under the 20,334 acre cumulative cap. This creates a strong incentive for Operators to reduce overall surface disturbance and reclaim disturbed areas as quickly as possible.

“Final” reclamation objectives are met when the site has reached functioning ecosystem status. At this point, the applicable Operator would be released from bond.

During the criteria development process, the JIO addressed a number of issues that led to these recommendations. The following questions and answers are intended to provide insight into what guided this decision.

What is the current ecological status of the Jonah Field?

Very little research and baseline data has been collected in the area to answer this question. After review of the Natural Resources Conservation Services (NRCS) ecological reference data, conducting various site visits, and interviewing a number of nature resource professionals, it was determined most of the Jonah field is in a late seral stage (an old plant community). It is currently heavily dominated by older aged sagebrush, but has the potential to produce a greater amount of understory vegetation and diversity of native plants.

What do we want the landscape to look like? Do we want it back to its pre-existing condition or could we create something “better”, i.e., a site with more value and diversity for its users?

A mosaic landscape consisting of plant communities in various age classes rather than a single age class (seral stages) provides more opportunities for its users. Reclamation of disturbed sites provides an opportunity to create this mosaic landscape.

Within most vegetative communities, natural ecological processes provide for succession. Succession consists of a series of vegetative stages initiated after some disturbance such as fire. This results in portions of older aged plant communities being set back to an earlier age. This cyclic process naturally creates a mosaic landscape with areas of vegetation in different age classes that provides multiple benefits to the various users. Since human presence has become an overwhelming factor in the ecological process and tends to disrupt the natural cycles of nature (i.e., fire suppression and development), the landscape has aged and is in need of minor disturbances to “wake up” the understory vegetation that promotes production and diversity.

How do we create this mosaic landscape?

These criteria will allow an initial decrease in the shrub complex of reclaimed sites mimicking a natural disturbance, which over time will return to the same pre-disturbance status. While succession is a natural process and will take decades to reach the current level of maturity, it is expected that the original native perennial plants along with early seral stage plants will be present on the site which indicates the ability of the site to revert back to pre-disturbance condition over time. This composition of vegetation resembles a plant community in an earlier seral stage and provides more herbaceous vegetative production and diversity than a late seral stage plant community.

Are these criteria achievable?

Ground truthing of numerous sites on the Jonah field as well as analysis of current monitoring data indicate that meeting these criteria is well within reason.

With cooperation between various agencies and individuals, we feel that the following criterion addresses the principle concerns for reclamation. The JIO feel these criteria will restore disturbed sites to their ecological potential by providing more vegetative diversity across the landscape. This is expected to result in both greater diversity for wildlife and greater productivity for livestock.

The JIO is also in the process of developing the monitoring guidelines that will address appropriate and acceptable methods for monitoring to determine if criteria have been met. This document will be available in the very near future.

Please provide comments to:

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Reclamation Criteria

Jonah Interagency Office Recommendations

I. INTRODUCTION

These reclamation criteria will be used to determine when roll-over and final reclamation has been met on federal lands within the Jonah Infill Drilling Project Area (JIDPA). These criteria were developed as required by the Jonah Infill Drilling Project Record of Decision (ROD), Appendix A, Reclamation Section, paragraph 4.

This document identifies the concept of succession, seral stages, and site productivity as driving goals. Succession and associated seral stages relate to vegetative community changes over time. Many areas become stagnant over time, and may lead to dominance of those sites by vegetation that may not adequately reflect its potential or amount of biodiversity that could be present at an earlier seral stage.

Vegetative diversity is the key component in the following goals and objectives of reclamation. It is generally agreed that the Jonah field consists of several plant communities, most of which are in later seral stages. Where sagebrush exists, it dominates the plant composition. On an overall project scale (30,500 acre area), the intensive energy development has presented the opportunity to create a mosaic landscape by reclaiming sites to an earlier seral stage plant community that is more diverse in vegetation.

Goal

The goal of reclamation in the Jonah Field is to create a stable ecosystem supporting a diverse floral and faunal composition. A stable ecosystem will promote soil stability, nutrient recycling, proper hydrological function, abundant wildlife habitat, and available livestock forage, as well as enhance the aesthetic quality of the landscape.

Objective

The objective of these criteria is to direct reclamation efforts into establishing a mosaic landscape with increased vegetative diversity. Additionally, these criteria specifically support the reclamation objectives contained in the Jonah Infill ROD, Appendix A. Where possible, plant diversity greater than the minimum requirements is preferred.

II. RECLAMATION CRITERIA

Due to variability of sites within the same ecological location, criteria will be considered fulfilled if vegetative inventory results are within +/- 5% of the requirement.

Each reclamation site will utilize a representative reference site for comparison to measure success of reclamation. A reference site must be undisturbed, similar in

vegetative composition, soil structure, slope, and aspect. If possible, the reference site should be adjacent to the reclamation site and similar in size.

Appendix A contains a recommended plant list while Appendix B contains the Federal and Wyoming State Noxious Weed Lists.

Roll-Over Criteria

1. Erosion Control:

The site must be in a stable state, i.e. no obvious erosive features, and percentage of bare ground must be equal to or less than the reference site.

2. Vegetative Criteria:

- a. Forbs:** The average density or frequency of forbs must be a minimum of 75% of the reference site. Diversity of forbs on a reclaimed site must be equal to or greater than the reference site.
- b. Shrubs:** The average density or frequency of the shrub component must be at least 50% of the reference site. This includes both shrubs and half shrubs (e.g. winterfat, fringed sage, etc.), but rabbit brush cannot account for more than 10% of total shrub composition. At least 15% of the shrub component must be the dominant species from the reference site. Individual shrub plants younger than 3 years old will not count towards roll-over. The average diversity of shrubs must be equal to or greater than the reference site.
- c. Grasses:** Reclaimed sites must have a minimum of 3 native perennial grass species present, two of which must be bunch grass species.
- d. Weeds:** Sites must be free from all species listed on the Wyoming or Federal noxious weed list. All state and federal laws regarding noxious weeds must be followed. Other highly competitive invasive species such as cheat grass and other weedy brome grasses are also prohibited. Non competitive weeds may be present in quantities that do not compete with native perennial plants.
- e. Plant Vigor:** Plants must be resilient as evidenced by well-developed root systems, flowers, and seed heads. Shrubs will be well established and in a "young" age class at a minimum (e.g. not comprised of seedlings that may not survive until the following year). All sites must exhibit the sustainability of the above desired attributes after the removal of external influences. A minimum of one growing season without external influences (irrigation, mat pads, fences, etc.) may satisfy this requirement.

Final Criteria

1. Ground Cover:

The site must be in stable condition and the percentage of bare ground must be equal to or less than the reference site.

2. Vegetative Criteria:

- a. Forbs:** The average density or frequency and diversity of forbs must be equal to or greater than the reference site.
- b. Shrubs:** The average density or frequency of the shrub component must be at least 50% of the reference site. This includes both shrubs and half shrubs (e.g. winterfat, fringed sage, etc.), but rabbit brush cannot account for more than 10% of total shrub composition. At least 25% of the shrub component must be the dominant species from the reference site. Individual shrub plants younger than 3 years old will not count towards roll-over. The average diversity of shrubs must be equal to or greater than the reference site.
- c. Grasses:** Reclaimed sites must produce equal to or greater pounds of production per acre compared to the reference site. A minimum of 3 native perennial species must be included with at least two bunch grass species.
- d. Weeds:** Sites must be free from all species listed on the Wyoming or Federal noxious weed list. All state and federal laws regarding noxious weeds must be followed. Other highly competitive invasive species such as cheat grass and other weedy brome grasses are also prohibited. Non competitive weeds may be present in quantities that do not compete with native perennial plants.
- e. Plant Vigor:** Plants must be resilient as evidenced by well-developed root systems and flowers. Shrubs will be well established and in a “young” age class at a minimum (e.g. not comprised of seedlings that may not survive until the following year).
- f. Ecological function:** To ensure soil stability and nutrient recycling, ground cover must be equal to or greater than the reference site and vegetative litter must be decomposing into the soil.

Appendix A

Recommended Plant List

This list should be somewhat adaptive due to current ongoing efforts by NRCS, BLM, Encana, Shell and others in the experimentation with various species and cultivars for reclamation.

Grasses:

Thickspike Wheatgrass*	(<i>Elymus lanceolatus</i>)
Western Wheatgrass*	(<i>Pascopyrum smithii</i>)
Bluebunch Wheatgrass	(<i>Pseudoroegneria_spicata</i>)
Indian Ricegrass	(<i>Achnatherum hymenoides</i>)
Letterman's Needlegrass	(<i>Achnatherum nelsonii</i>)
Basin Wildrye	(<i>Leymus cinereus</i>)
Needleandthread	(<i>Hesperostipa comata</i>)
Bottlebrush Squirreltail	(<i>Elymus elymoides</i>)
Sandberg Bluegrass	(<i>Poa secunda</i>)
Needleleaf Sedge	(<i>Carex duriuscula</i>)
Prairie Junegrass	(<i>Koeleria macrantha</i>)

*Recommend planting only one rhizomatous species due to the competitive nature of these species.

Forbs:

American Vetch*	(<i>Vicia americana</i>)
Sulfur flower*	(<i>Eriogonum umbellatum</i>)
Scarlet Globemallow	(<i>Sphaeralcea coccinea</i>)
Great Basin Penstemon	(<i>Pentstemon subglaber</i>)
White Evening Primrose	(<i>Oenothera</i>)
Pacific Aster (very high cost)	(<i>Aster chilensis</i>)

Early Indian Paintbrush	(<i>Castilleja applegatei</i>)
False Dandelion*#	(<i>Agoseris glauca</i>)
Munro globemallow	(<i>Spaheralcea munroa</i>)
Lupine	(<i>Lupinus perennis</i>)
Palmer Penstemon	(<i>Penstemon palmerii</i>)
Blue Flax	(<i>Linium lewisii</i>)
Rocky Mt. Beeplant	(<i>Cleome serrulata</i>)
Milkvetches*	(<i>Astragalus spp.</i> – native aridland ecotypes)
Salt and Pepper Lomatium	(<i>Lomatium germontii</i>)
Sagebrush mariposa lily*#	(<i>Calochortus macrocarpus</i>)
Maiden blue eyed Mary	(<i>Collinsia parviflora</i>)
Fleabane*#	(<i>Erigeron spp.</i>)
Sulphur-flower buckwheat*#	(<i>Eriogonum umbellatum</i>)
Fernleaf biscuitroot*#	(<i>Lomatium dissectum</i>)
Nodding microserus*#	(<i>Microseris nutans</i>)
Hood's Phlox*#	(<i>Phlox hoodii</i>)
Vetches*#	(<i>Vicia spp.</i>)

Non-native forbs: (would require BLM approval but could be considered for state or private lands)

Cicer milkvetch*	(<i>Astragalus cicer</i>)
Northern Sweetvetch	(<i>Hedysarum boreale</i>)
Falcata alfalfa*	(<i>Medicago sp.</i>)
Prickly lettuce*	(<i>Lactuca serriola</i>)
Yellow sweetclover*	(<i>Melilotus officinalis</i>)
Sanfoin*	(<i>Onobrychis viciifolia</i>)
Dandelion*	(<i>Taraxicum officinale</i>)

Yellow salsify* (*Tragopogon dubius*)

* "Most important species" for sage grouse from a list obtained from Alan Sands and compiled by Alan Sands and Kerry Reese. Modified from a list compiled by Scott Lambert for the northern Great Basin.

These species have uncertainty regarding adaptability to Jonah (a 7-9 inch precipitation zone).

Shrubs:

Winterfat (*Krascheninnikovia lanata*)

Wyoming Big Sage (*Artemisia tridentate wyomingensis*)

Rubber rabbitbrush* (*Chrysothamnus nauseosus ssp hololeucus*)

Gardner's Saltbush (*Atriplex gardneri*)

Four-wing Saltbush (*Atriplex canescens*)

Shadscale (*Atriplex confertifolia*)

Fringed sagewort (*Artemisia frigida*)

Spiny Hopsage (*Grayia spinosa*)

Rubber Rabbitbrush subspecies (*Chrysothamnus nauseosus ssp. linnaefolius*)

Green Molly (*Kochia Americana*)

Bud Sage (*Aremisia spinescens*)

Fringed sage (*Artemisia frigida*)

Black Sage (*Artemisia nova*)

Appendix B

State and Federal Noxious Weed List

WYOMING WEED & PEST CONTROL ACT DESIGNATED LIST

Designated Noxious Weeds .S. 11-5-102 (a)(xi) and Prohibited Noxious Weeds W.S. 1-12-104

- | | | |
|------|------------------------|---|
| (1) | Field bindweed | (<i>Convolvulus arvensis</i> L.) |
| (2) | Canada thistle | (<i>Cirsium arvense</i> L.) |
| (3) | Leafy spurge | (<i>Euphorbia esula</i> L.) |
| (4) | Perennial sowthistle | (<i>Sonchus arvensis</i> L.) |
| (5) | Quackgrass | (<i>Agropyron repens</i> (L.) Beauv.) |
| (6) | Hoary cress (whitetop) | (<i>Cardaria draba</i> and <i>Cardaria pubescens</i> (L.) Desv.) |
| (7) | Perennial pepperweed | (<i>giant whitetop</i>) (<i>Lepidium latifolium</i> L.) |
| (8) | Ox-eye daisy | (<i>Chrysanthemum leucanthemum</i> L.) |
| (9) | Skeletonleaf bursage | (<i>Franseria discolor</i> Nutt.) |
| (10) | Russian knapweed | (<i>Centaurea repens</i> L.) |
| (11) | Yellow toadflax | (<i>Linaria vulgaris</i> L.) |
| (12) | Dalmatian toadflax | (<i>Linaria dalmatica</i> (L.) Mill.) |
| (13) | Scotch thistle | (<i>Onopordum acanthium</i> L.) |
| (14) | Musk thistle | (<i>Carduus nutans</i> L.) |
| (15) | Common burdock | (<i>Arctium minus</i> (Hill) Bernh.) |
| (16) | Plumeless thistle | (<i>Carduus acanthoides</i> L.) |
| (17) | Dyers woad | (<i>Isatis tinctoria</i> L.) |
| (18) | Houndstongue | (<i>Cynoglossum officinale</i> L.) |

- (19) Spotted knapweed (*Centaurea maculosa* Lam.)
- (20) Diffuse knapweed (*Centaurea diffusa* Lam.)
- (21) Purple loosestrife (*Lythrum salicaria* L.)
- (22) Saltcedar (*Tamarix* spp.)
- (23) Common St. Johnswort (*Hypericum perforatum*)
- (24) Common Tansy (*Tanacetum vulgare*)

FEDERAL NOXIOUS WEED LIST (as of 09/08/2000)

Aquatic/Wetland

- (1) Mosquito fern, water velvet (*Azolla pinnata*)
- (2) Mediterranean clone of caulerpa (*Caulerpa taxifolia*)
- (3) Anchored waterhyacinth (*Eichhornia azurea*)
- (4) Hydrilla (*Hydrilla verticillata*)
- (5) Miramar weed (*Hygrophila polysperma*)
- (6) Chinese waterspinach (*Ipomoea aquatica*)
- (7) Oxygen weed (*Lagarosiphon major*)
- (8) Ambulia (*Limnophila sessiliflora*)
- (9) Melaleuca (*Melaleuca quinquenervia*)
- (10) Monochoria (*Monochoria hastata*)
- (11) Pickerel weed (*Monochoria vaginalis*)
- (12) Duck-lettuce (*Ottelia alismoides*)
- (13) Arrowhead (*Sagittaria sagittifolia*)
- (14) Giant salvinia (*Salvinia auriculata*)
- (15) Giant salvinia (*Salvinia biloba*)
- (16) Giant salvinia (*Salvinia herzogii*)

- (17) Giant salvinia (*Salvinia molesta*)
- (18) Wetland nightshade (*Solanum tampicense*)
- (19) Exotic bur-reed (*Sparganium erectum*)

Parasitic

- (20) No common name (*Aeginetia* spp.)
- (21) No common name (*Alectra* spp.)
- (22) Dodders (*Cuscuta* spp) other than native or widely distributed species
- (23) Broomrapes (*Orobanche* spp.) other than native or widely distributed species
- (24) Witchweeds (*Striga* spp.)

Terrestrial

- (25) Crofton weed (*Ageratina adenophora*)
- (26) Sessile joyweed (*Alternanthera sessilis*)
- (27) Onionweed (*Asphodelus fistulosus*)
- (28) Animated or wild oat (*Avena sterilis* L.)
- (29) Borreria (*Spermacoce alata*)
- (30) Wild safflower (*Carthamus oxyacanthus*)
- (31) Pilipiliula (*Chrysopogon aciculatus*)
- (32) Bengal dayflower (*Commelina benghalensis*)
- (33) Common crupina (*Crupina vulgaris*)
- (34) African couch grass (*Digitaria abyssinica*)
- (35) Velvet fingergrass (*Digitaria velutina*)
- (36) Lightning weed, alfombrilla (*Drymaria arenarioides*)
- (37) Three-cornered jack (*Emex australis*)
- (38) Devil's thorn (*Emex spinosa*)

(39)	Goatsrue	<i>(Galega officinalis)</i>
(40)	Giant hogweed	<i>(Heracleum mantegazzianum)</i>
(41)	Cape tulip	<i>(Homeria spp.)</i>
(42)	Brazilian satintail	<i>(Imperata brasiliensis)</i>
(43)	Cogongrass	<i>(Imperata cylindrica)</i>
(44)	Murain-grass	<i>(Ischaemum rugosum)</i>
(45)	Asian sprangletop	<i>(Leptochloa chinensis)</i>
(46)	African boxthorn	<i>(Lycium ferocissimum)</i>
(47)	No common name	<i>(Melastoma malabathricum)</i>
(48)	Mile-a-minute	<i>(Mikania cordata)</i>
(49)	Mile-a-minute	<i>(Mikania micrantha)</i>
(50)	Giant sensitive plant	<i>(Mimosa invisa)</i>
(51)	Catclaw mimosa	<i>(Mimosa pigra)</i>
(52)	Serrated tussock	<i>(Nassella trichotoma)</i>
(53)	Jointed prickly pear	<i>(Opuntia aurantiaca)</i>
(54)	Red rice	<i>(Oryza longistaminata)</i>
(55)	Red rice	<i>(Oryza punctata)</i>
(56)	Red rice	<i>(Oryza rufipogon)</i>
(57)	Kodo-millet	<i>(Paspalum scrobiculatum)</i>
(58)	Kikuyugrass	<i>(Pennisetum clandestinum)</i>
(59)	African feathergrass	<i>(Pennisetum macrourum)</i>
(60)	Kyasuma-grass	<i>(Pennisetum pedicellatum)</i>
(61)	Missiongrass	<i>(Pennisetum polystachion)</i>
(62)	<i>Prosopis</i> spp. are mesquites	<i>(Prosopis alapataco)</i>
(63)	No common name	<i>(Prosopis argentina)</i>

(64)	No common name	<i>(Prosopis articulate)</i>
(65)	No common name	<i>(Prosopis burkartii)</i>
(66)	No common name	<i>(Prosopis caldenia)</i>
(67)	No common name	<i>(Prosopis calingastana)</i>
(68)	No common name	<i>(Prosopis campestris)</i>
(69)	No common name	<i>(Prosopis castellanosii)</i>
(70)	No common name	<i>(Prosopis denudans)</i>
(71)	No common name	<i>(Prosopis elata)</i>
(72)	No common name	<i>(Prosopis farcta)</i>
(73)	No common name	<i>(Prosopis ferox)</i>
(74)	No common name	<i>(Prosopis fiebrigii)</i>
(75)	No common name	<i>(Prosopis hassleri)</i>
(76)	No common name	<i>(Prosopis humilis)</i>
(77)	No common name	<i>(Prosopis kuntzei)</i>
(78)	No common name	<i>(Prosopis pallida)</i>
(79)	No common name	<i>(Prosopis palmeri)</i>
(80)	No common name	<i>(Prosopis reptans)</i>
(81)	No common name	<i>(Prosopis rojasiana)</i>
(82)	No common name	<i>(Prosopis ruizlealii)</i>
(83)	No common name	<i>(Prosopis ruscifolia)</i>
(84)	No common name	<i>(Prosopis sericantha)</i>
(85)	No common name	<i>(Prosopis strombulifera)</i>
(86)	No common name	<i>(Prosopis torquata)</i>
(87)	Itchgrass	<i>(Rottboellia cochinchinensis)</i>
(88)	Wild blackberry complex	<i>(Rubus fruticosus)</i>

- | | | |
|------|---------------------|--------------------------------|
| (89) | Wild blackberry | <i>(Rubus moluccanus)</i> |
| (90) | Wild sugarcane | <i>(Saccharum spontaneum)</i> |
| (91) | Wormleaf salsola | <i>(Salsola vermiculata)</i> |
| (92) | Cattail grass | <i>(Setaria pallide-fusca)</i> |
| (93) | Turkeyberry | <i>(Solanum torvum)</i> |
| (94) | Tropical soda apple | <i>(Solanum viarum)</i> |
| (95) | Coat buttons | <i>(Tridax procumbens)</i> |
| (96) | Liverseed grass | <i>(Urochloa panicoides)</i> |

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