July 3, 2023

Memorandum

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Jim Boyd, Montana Listing/Recovery Biologist, U.S. Fish and Wildlife Service
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From: P. J. White, Natural Resources Program Manager, Yellowstone National Park

Subject: Information for the Species Status Assessment on Yellowstone Bison

The United States Fish and Wildlife Service (USFWS) recently announced they would initiate a status review of Yellowstone bison based on information provided in three petitions received from 2014 to 2018 (USDI, USFWS 2022). A species status assessment begins with the compilation of information, including species' natural history, ecological needs, abundance, distribution, demographics, condition of habitats, and genetic diversity. The assessment then forecasts the viability of the species given various scenarios of future environmental conditions and conservation efforts (USDI, USFWS 2016). The species status assessment is not a decision document; rather it provides biological information, analyses, and predictions to support decisions pursuant to the Endangered Species Act of 1973 (16 USC 1531 *et. seq*.). The species status assessment for Yellowstone bison is scheduled for completion in 2026 (USDI, USFWS 2023).

This document provides relevant information for the status review of Yellowstone bison by the USFWS and a subsequent determination of whether these bison are a distinct population segment, whether they are threatened or endangered, and the extent of their resiliency, redundancy, and representation. In this document, the word 'cull' refers to bison captured for possible inclusion in quarantine (called the Bison Conservation Transfer Program), shipment to slaughter, or shooting on-site. The word 'harvest' refers to bison shot during hunts outside the park by members of American Indian tribes[1] pursuant to long-standing treaties with the federal government and public hunters with permits from Montana Fish, Wildlife and Parks. The word 'removals' refers to the combined numbers of harvests and culls.

Distinct Population Segment

The petitions received by the USFWS suggest Yellowstone bison are a distinct population segment of plains bison and the central and northern breeding herds may be distinct segments as well. A distinct population segment is a discrete and significant segment of a species that can be analyzed as if it were a species under the Endangered Species Act. The USFWS considers two elements when evaluating whether to designate a distinct population segment: the discreteness of the population segment in relation the remainder of the species; and the significance of the population segment to the species (USDI, USFWS and US Department of Commerce, National Oceanic and Atmospheric Administration 1996).

Discreteness

By 1900, there were only about two dozen bison left in the Yellowstone area due to their widespread slaughter by colonists during the 1870s and 1880s. These bison spent winter in the Pelican Valley in the central portion of Yellowstone National Park (YNP) and moved to the Mirror Plateau and upper Lamar

[1] American Indian tribes include any bands, nations, or other organized groups the Secretary of the Interior includes in the Federally Recognized Indian Tribe List Act of 1994, as amended (25 USC 5130-5131).

River drainage in the northeastern portion of YNP during summer (Figure 1; Meagher 1973). To restore bison to the northern portion of YNP, managers relocated 18 females (some pregnant) from northwestern Montana, three males from Texas, and four indigenous calves from the Pelican Valley to northern YNP during the early 1900s. Managers fed these bison during winter at the Buffalo Ranch in the Lamar Valley and herded them to the Mirror Plateau and upper Lamar River area during summer (Meagher 1973). As a result, some of the native Pelican bison likely mixed and bred with the introduced Lamar bison during the breeding season from mid-July to mid-August. Bison numbers increased rapidly to about 1,100 by 1930. In 1936, managers relocated 71 bison from the Lamar Valley to the Hayden Valley and Firehole River area in central YNP, creating the Mary Mountain herd (Meagher 1973).

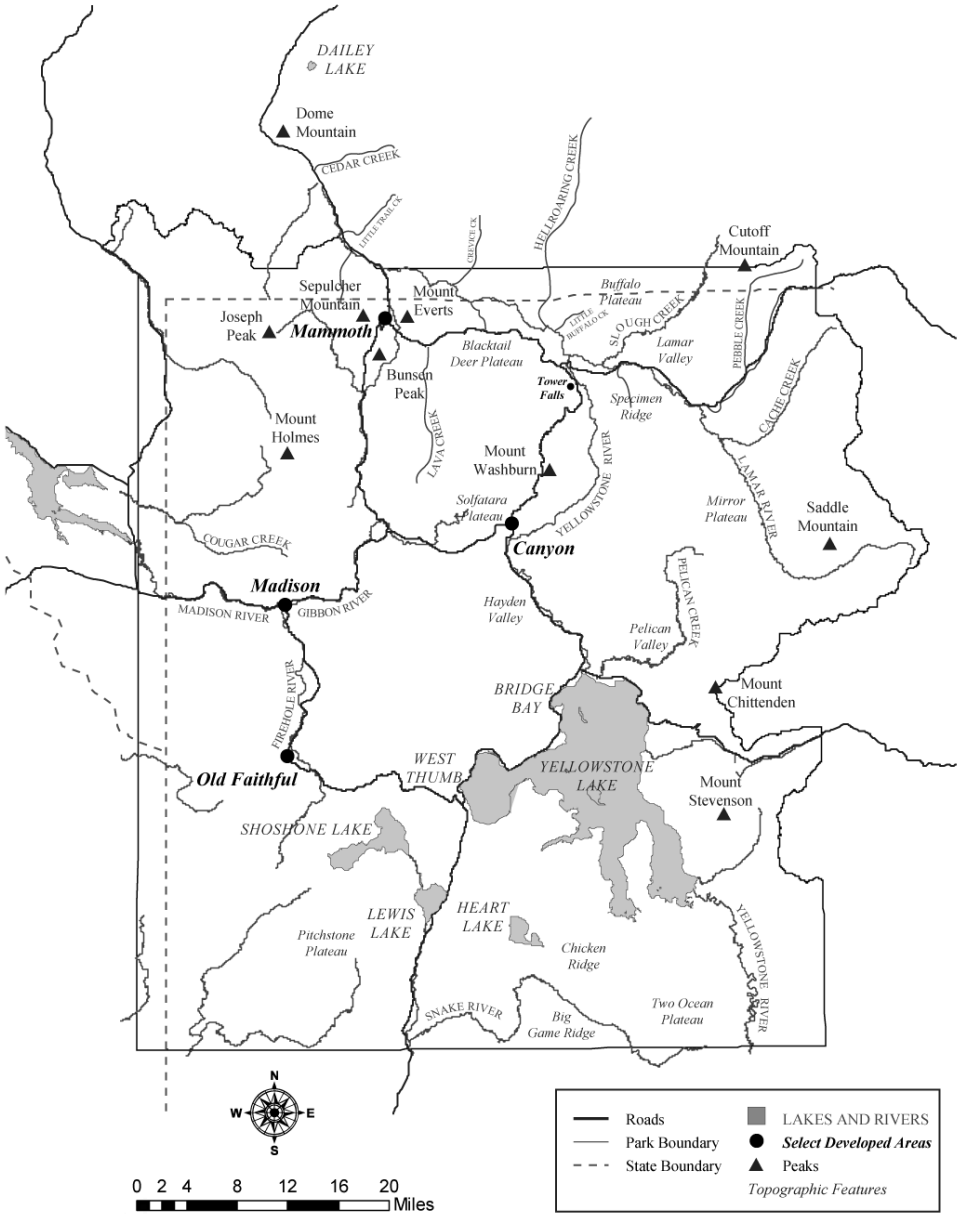

Figure 1. Yellowstone National Park and nearby areas of Montana with geographic features and place names.

Managers stopped feeding and herding bison in the Lamar Valley in 1952, after which bison moved about freely. However, managers shot or captured and shipped about 3,500 bison from this herd between 1930 and 1966 to reduce numbers and remove individuals with the disease brucellosis. For similar reasons, managers removed about 860 Mary Mountain bison and 150 Pelican bison between 1954 and 1966. These removals reduced numbers to about 70 Lamar, 160 Pelican, and 188 Mary Mountain bison by winter in 1968 (Meagher 1973). Thereafter, managers stopped removing bison and allowed numbers to vary in response to forage availability, predation, and weather. Bison numbers increased rapidly to about 1,700 during the 1970s and 3,000 during the 1980s. Some Lamar bison began spending both summer and winter in the Lamar Valley, while others pioneered winter ranges westward along the Yellowstone River towards the northern boundary (Meagher 1989). Pelican bison began moving west to the northern shore of Yellowstone Lake and along the Yellowstone River to the Hayden Valley. Eventually, bison spending winter in the Pelican Valley stopped moving to the Mirror Plateau and upper Lamar River area during summer and mostly remained in the Hayden Valley (Meagher 1998). Thus, there was likely considerable mixing of descendants from the native (Pelican) and introduced (Lamar/Mary Mountain) lineages.

In addition, more bison began moving from the Hayden Valley to the Firehole River area and some continued along the Gibbon and Madison rivers towards the western boundary during winter. Others began moving to northern YNP, likely in response to increasing bison numbers and deep snow depths that reduced forage availability (Meagher 1993, Fuller et al. 2007). A few bison migrated to both the western and northern boundary areas during the same winter. As a result, there was probably further mixing of descendants from the native and introduced lineages and distinguishing between descendants of Lamar, Pelican, and Mary Mountain bison based on their location in the park became impossible. Instead, biologists began counting and referring to bison that spent summer in the central and northern regions of YNP as the central and northern herds, respectively (White et al. 2022a).

During the past two decades, there were significant movements of bison between central and northern YNP that further mixed descendants of the introduced and native lineages (White et al. 2022a). Two-thirds of adult females fitted with radio-collars in central YNP during 2004 to 2017 moved in groups with hundreds of other female and young bison to northern YNP during winter. About half of these collared females remained in northern YNP at least through the breeding season the following summer (Wallen and White 2015). In addition, bison sampled in central and northern YNP during 2011-2012 did not have distinct mitochondrial genetic make-ups and the native and introduced lineages were found in both regions of the park in about equal proportions (Forgacs et al. 2016). Thus, Yellowstone bison appeared to be a single intermixing population, with movements, breeding, and gene flow between bison originating from central and northern YNP (White and Wallen 2012). Geneticists from Texas A&M University concluded “[o]ur finding that there is no subdivision based on mtDNA [mitochondrial deoxyribonucleic acid] support that Yellowstone bison can be managed - for mitochondrial haplotype diversity - as a single population with multiple breeding segments” (Forgacs et al. 2016).

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Significance

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(b)5 Draft-Deliberative Yellowstone bison are one of a few unfenced, wild, wide-ranging populations of plains bison in existence today—and the only population large enough to be considered ecologically and genetically viable (Hedrick 2009, Gross et al. 2010). Thus, to many native people and scientists this population represents the only surviving natural occurrence of plains bison (Plumb and Sucec 2006, Freese et al. 2007, Sanderson et al. 2008, Hedrick 2009, Dratch and Gogan 2010, Gross et al. 2010).

Bison sampled in the central and northern regions of YNP during 1997 to 2003 had significantly different distributions of alleles and genotypes based on microsatellite DNA markers and were genetically distinguishable based on 20 alleles only found in one of the two regions (Halbert et al. 2012). Based on these analyses, the petitioners contend Yellowstone bison are comprised of at least two genetically distinct subpopulations that are being differentially affected by culling, which could decrease genetic viability (USDI, USFWS 2015). The human relocation of plains bison from northwestern Montana into the Lamar Valley and Mary Mountain area of YNP (circa 1909 and 1936), with a different genetic lineage than the indigenous bison that spent winter in the Pelican Valley of Yellowstone, created population substructure and regional genetic differentiation in Yellowstone bison (White and Wallen 2012). However, there were significant bison movements and dispersal from central to northern YNP during the past two decades and it would be impossible to recreate genetically distinct herds of the indigenous and introduced genetic lineages given this mixing (White and Wallen 2012, Wallen and White 2015). Instead, the National Park Service (NPS) is allowing ecological processes, such as natural selection, migration, and dispersal, to prevail and influence how population and genetic substructure is maintained rather than actively managing to try and perpetuate an artificially created substructure. It would be impossible to stop bison from moving between the central and northern portions of the park or to force them to remain in a particular region (White and Wallen 2012).

Listing Factors

The petitions received by the USFWS requested Yellowstone bison be listed as threatened or endangered under the Endangered Species Act due to the curtailment of their historic range, lack of access to existing winter range, and loss of genetic diversity due to overutilization through culling and hunting because of the chronic presence of the disease brucellosis in the population (USDI, USFWS 2022). The USFWS can determine a species is threatened or endangered due to one or more of the following factors: A) present or threatened destruction, modification, or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific, or educational purposes; C) disease or predation; D) inadequacy of existing regulatory mechanisms; and E) other natural or manmade factors affecting its survival (16 USC 1533(a)(1)).

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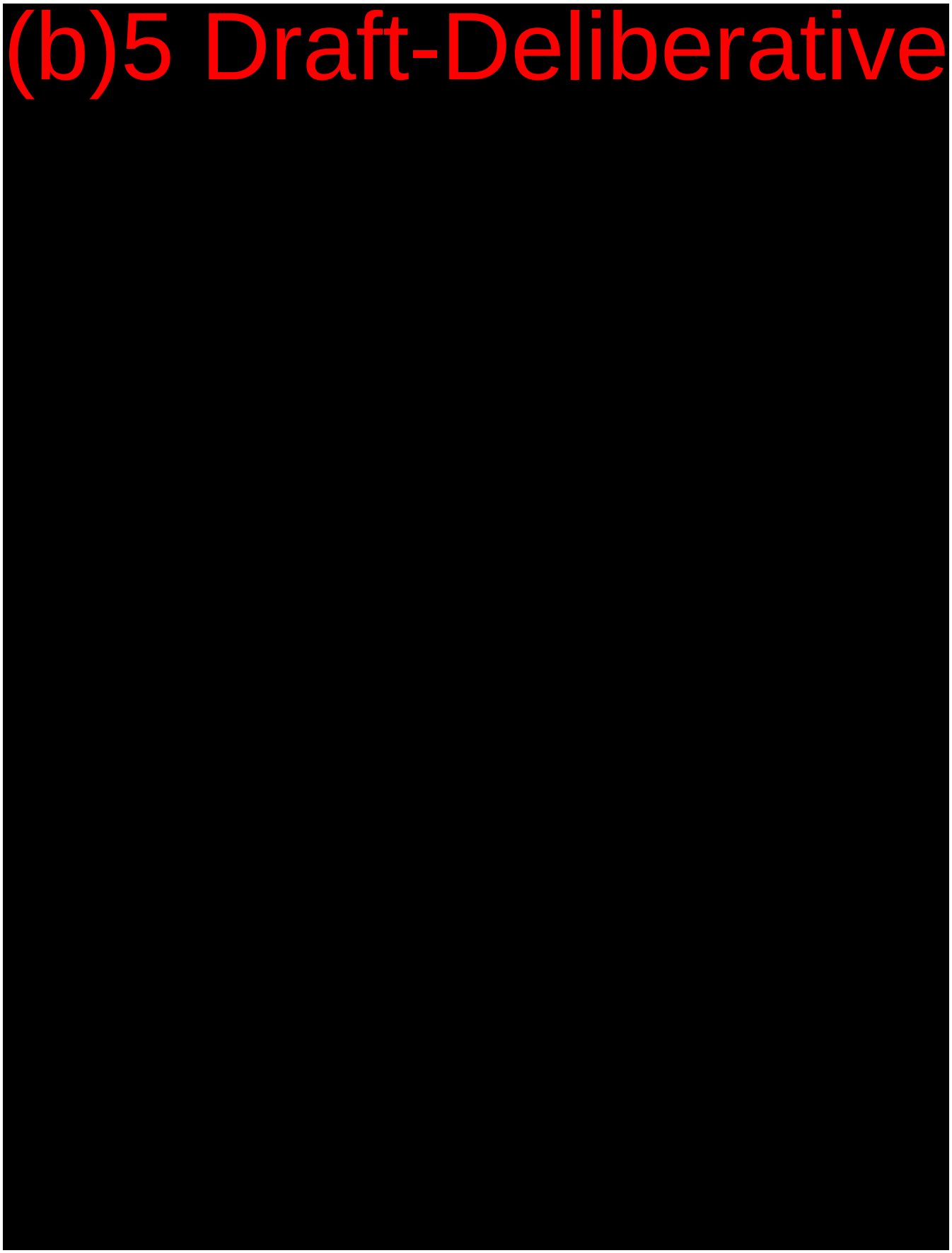
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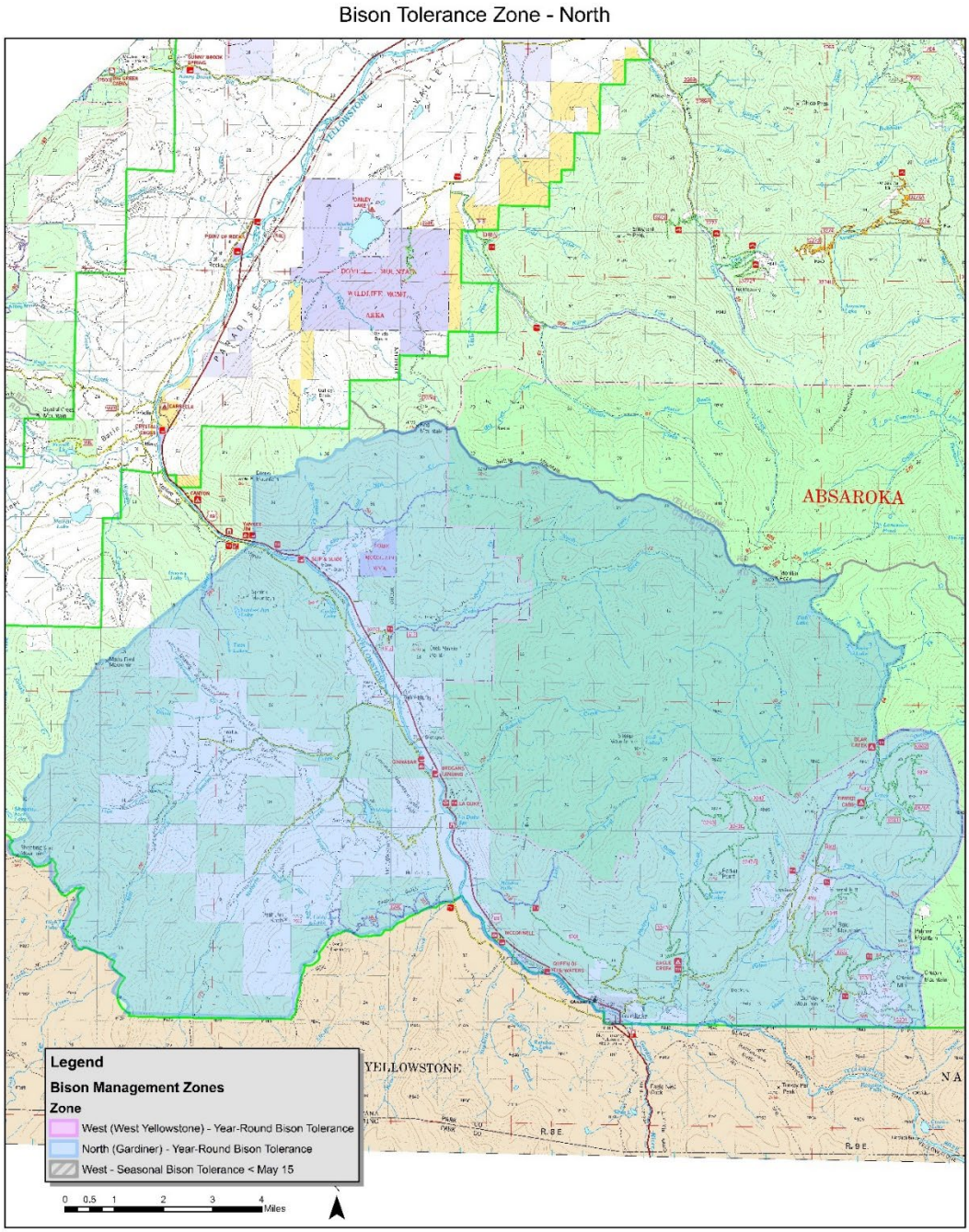

Figure 2. Northern management area in Montana for the Interagency Bison Management Plan (Randy Scarlett, Custer Gallatin National Forest, and Julie Anton Randall, Eco Mare Terra International).

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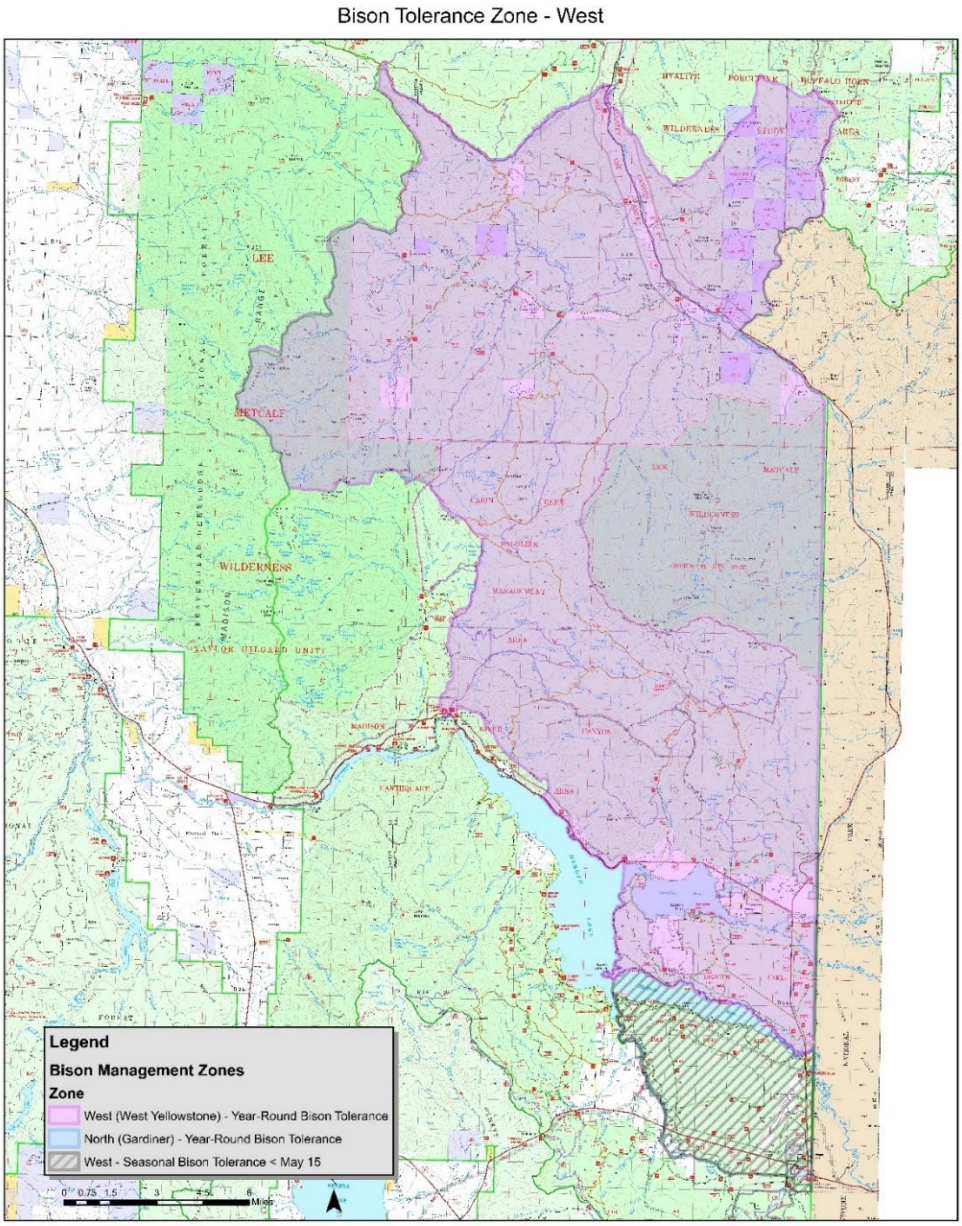

Figure 3. Western management area in Montana for the Interagency Bison Management Plan (Randy Scarlett, Custer Gallatin National Forest, and Julie Anton Randall, Eco Mare Terra International).

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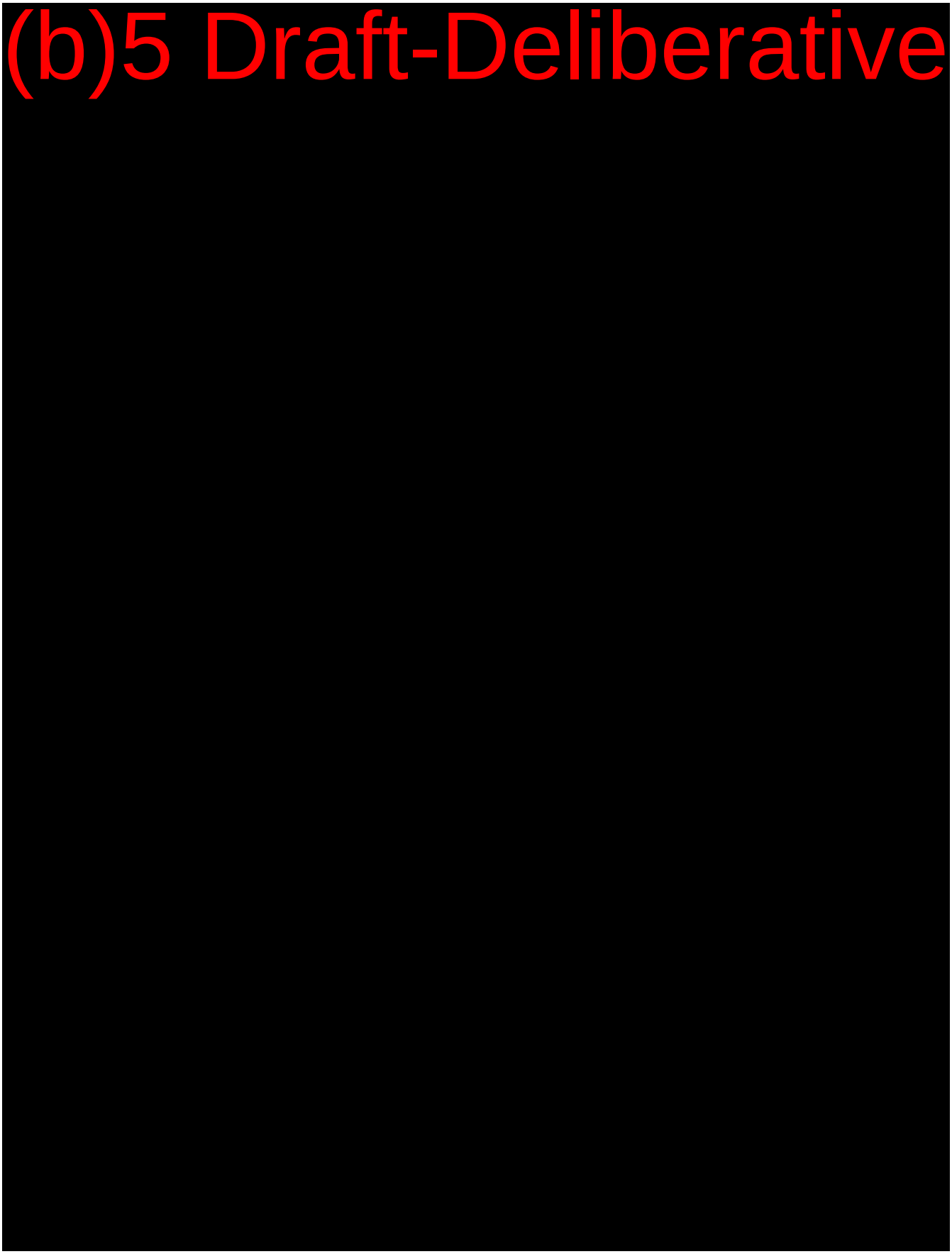
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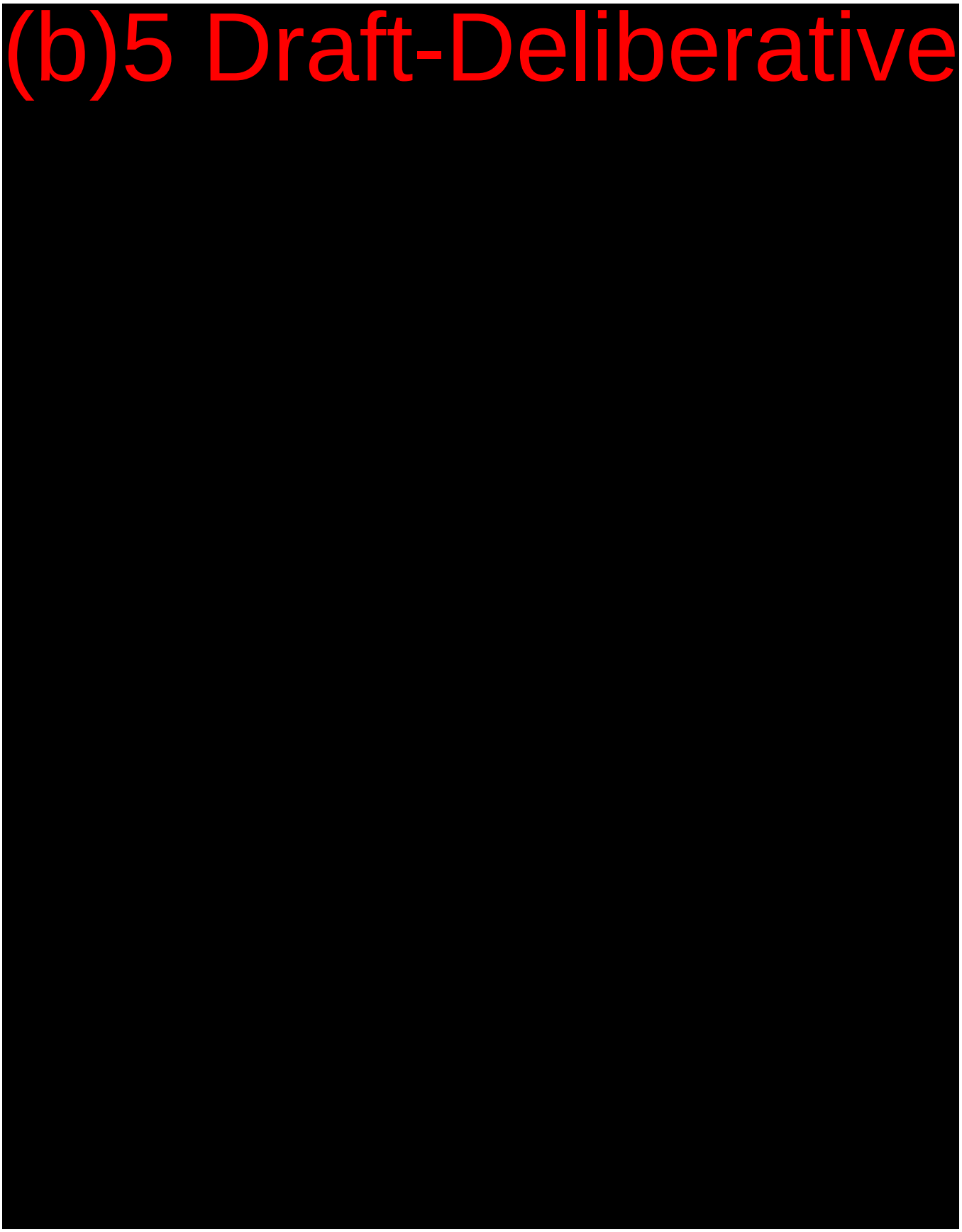
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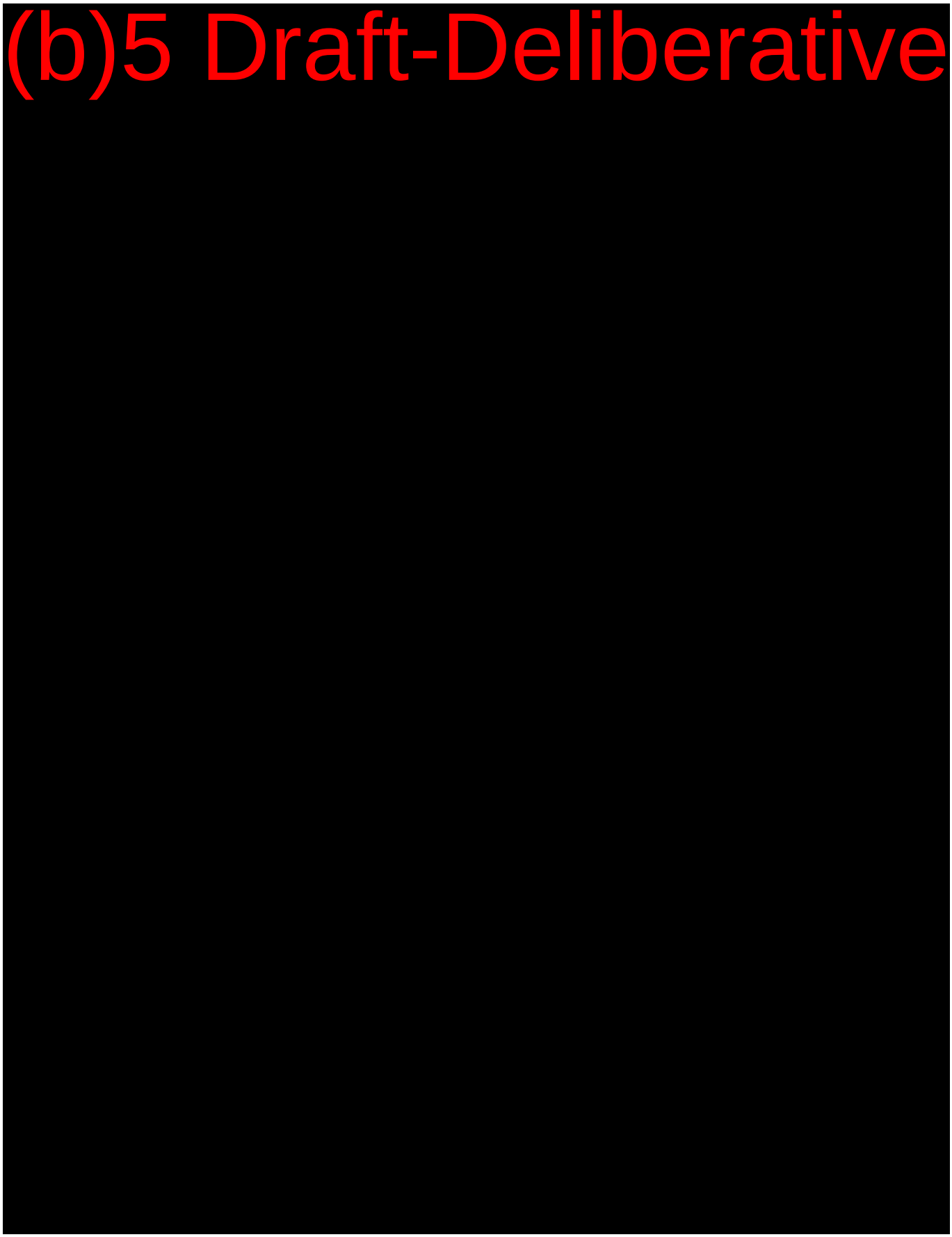
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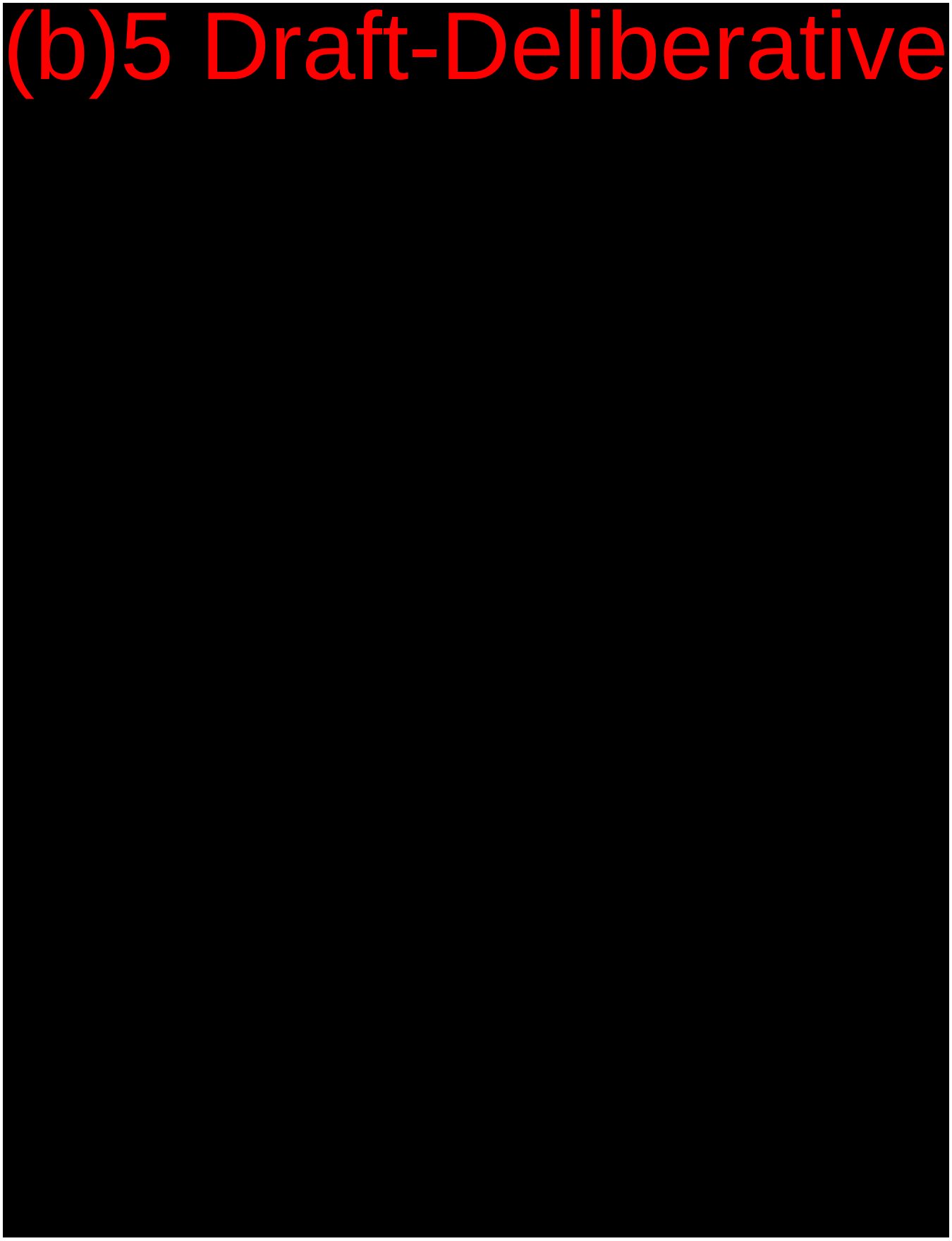
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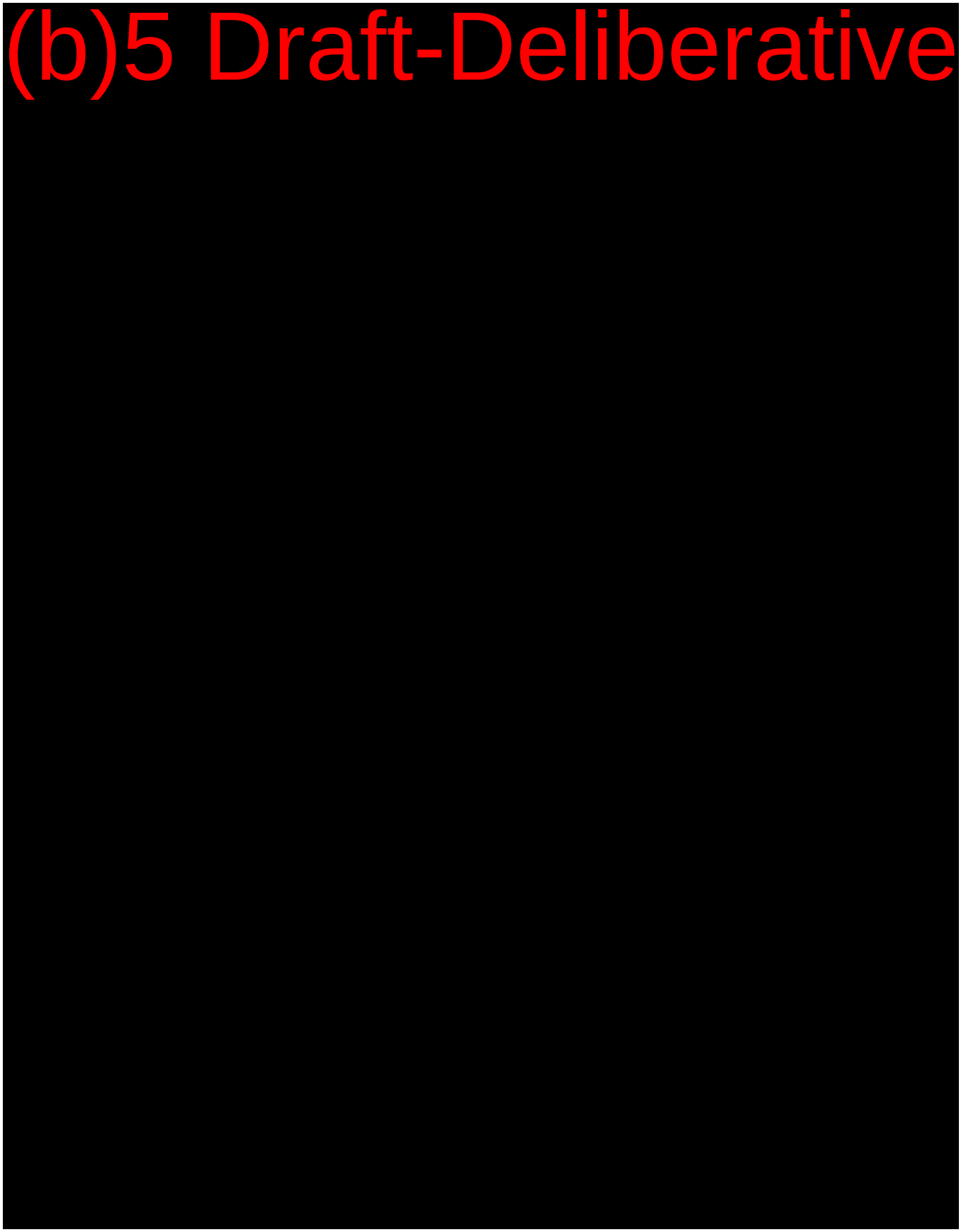
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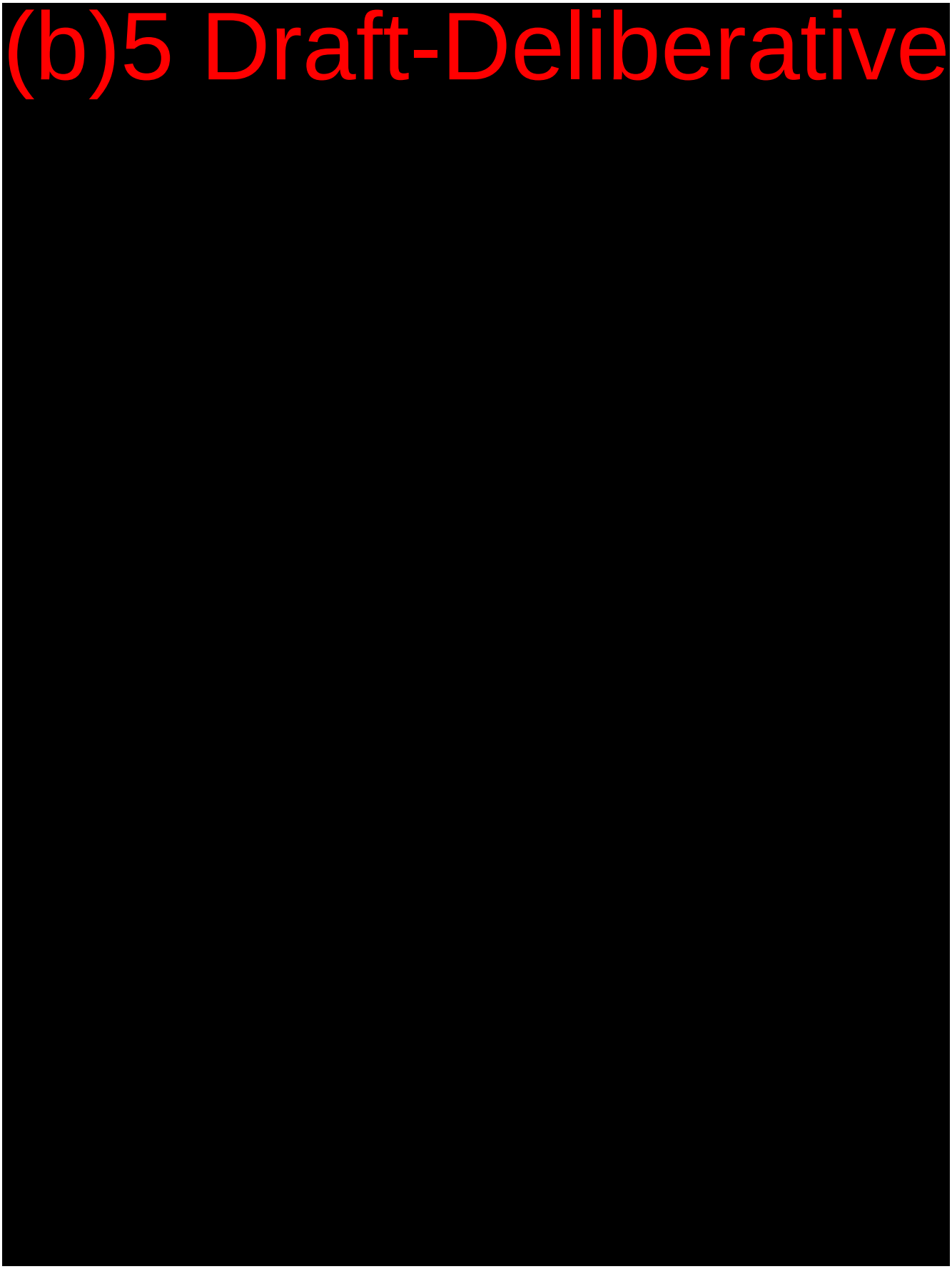
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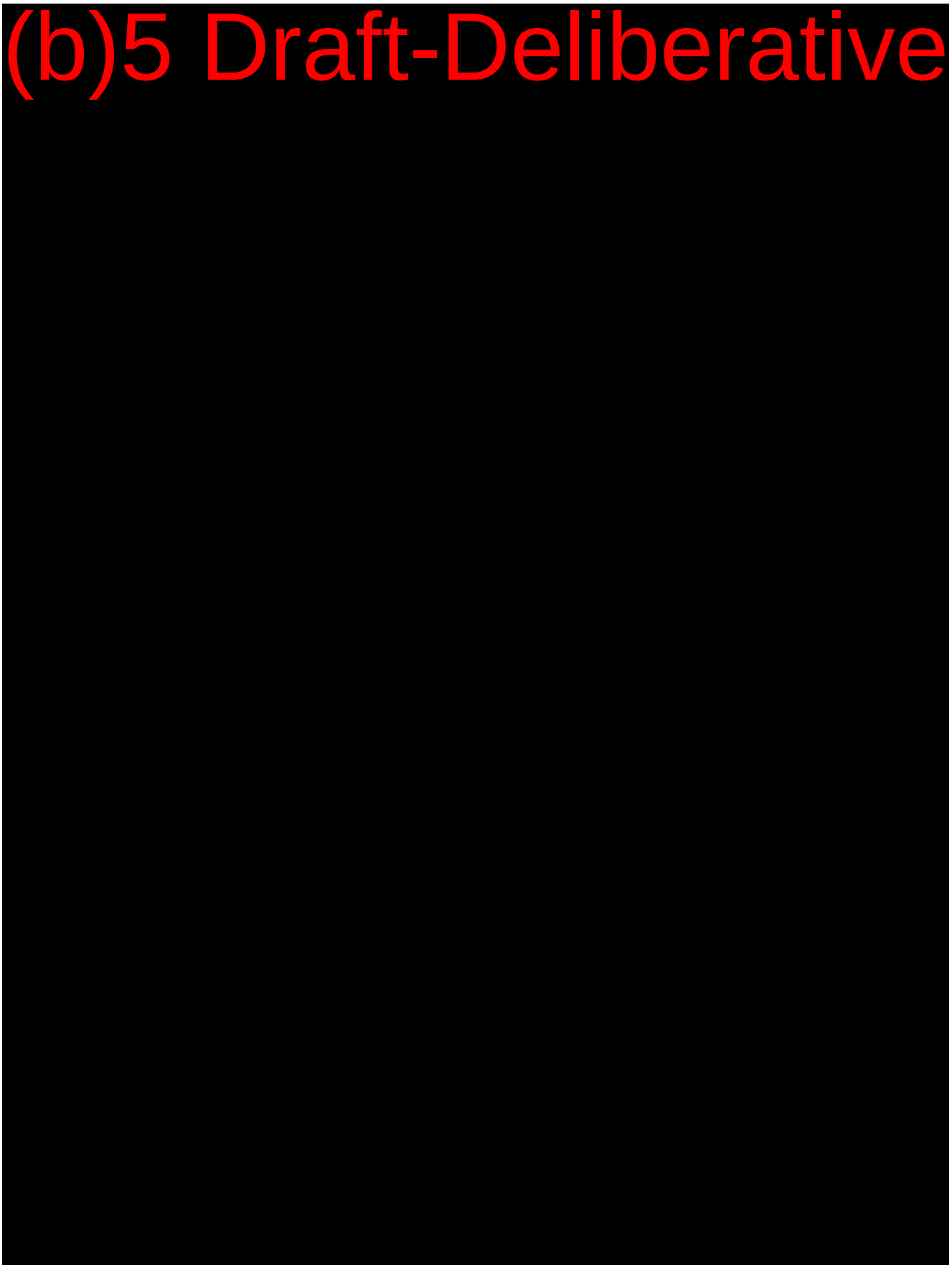
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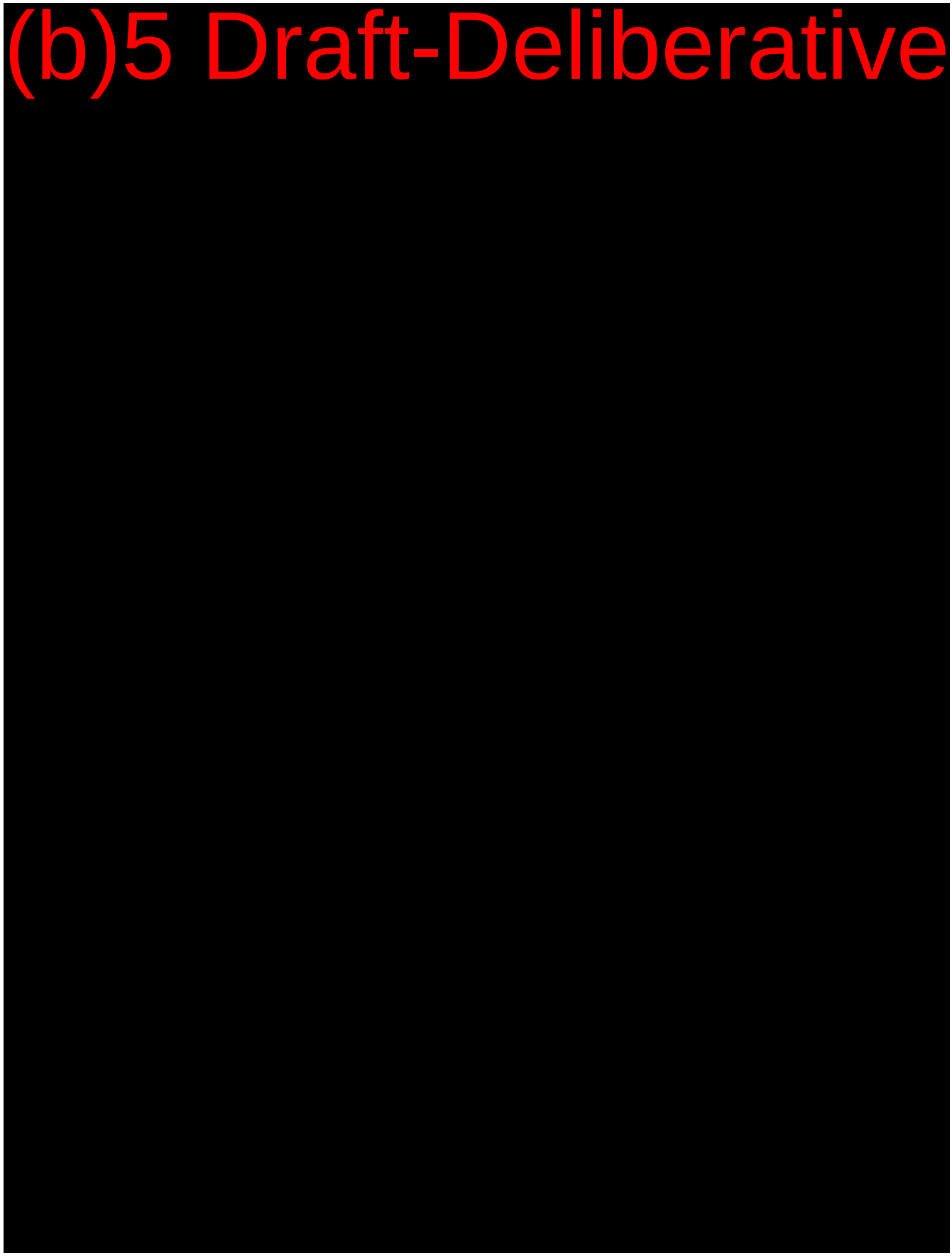
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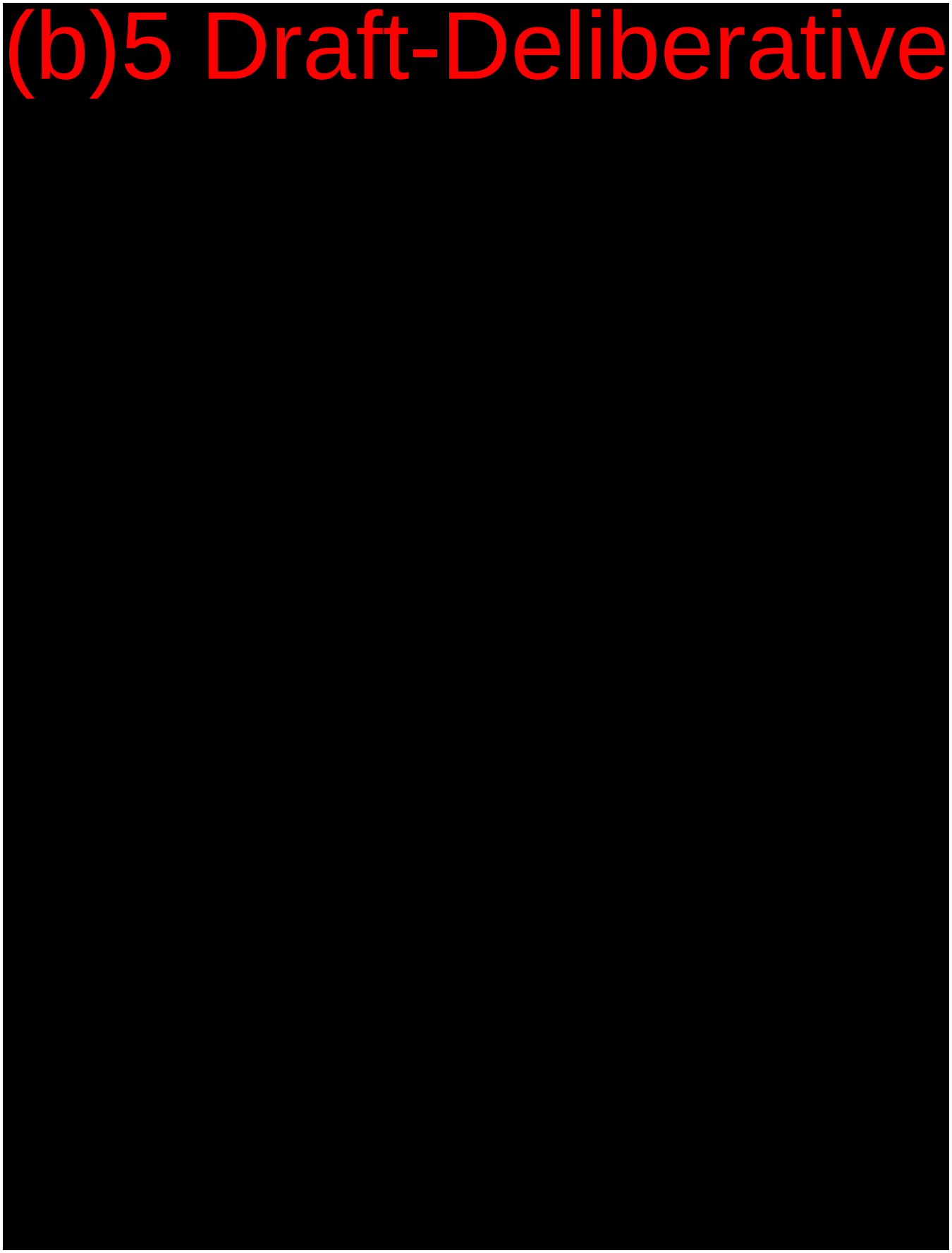
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Species Status Assessment

A species status assessment evaluates the conservation biology principles of resiliency, redundancy, and representation, and forecasts the viability of the species (or distinct population segment) over time for various scenarios of future environmental conditions and conservation efforts (Gates and Ellison 2010, USDI, USFWS 2016). Resiliency refers to sustaining populations with a high probability of persisting for centuries due to their large size and high potential growth rate, which would enable them to withstand and recover from unpredictable events such as severe weather or disease outbreaks. Redundancy refers to the preservation of a sufficient number of large, connected populations to withstand local catastrophic events, such as a virulent disease outbreak or large winterkill (starvation) in a single population. Representation refers to preserving populations across the range of environments (habitats) historically used by the

species to preserve genetic diversity, local adaptive capabilities, and enhance the likelihood of adaptation to future changes in environmental conditions, such as climate change (Gates and Ellison 2010, USDI, USFWS 2016).

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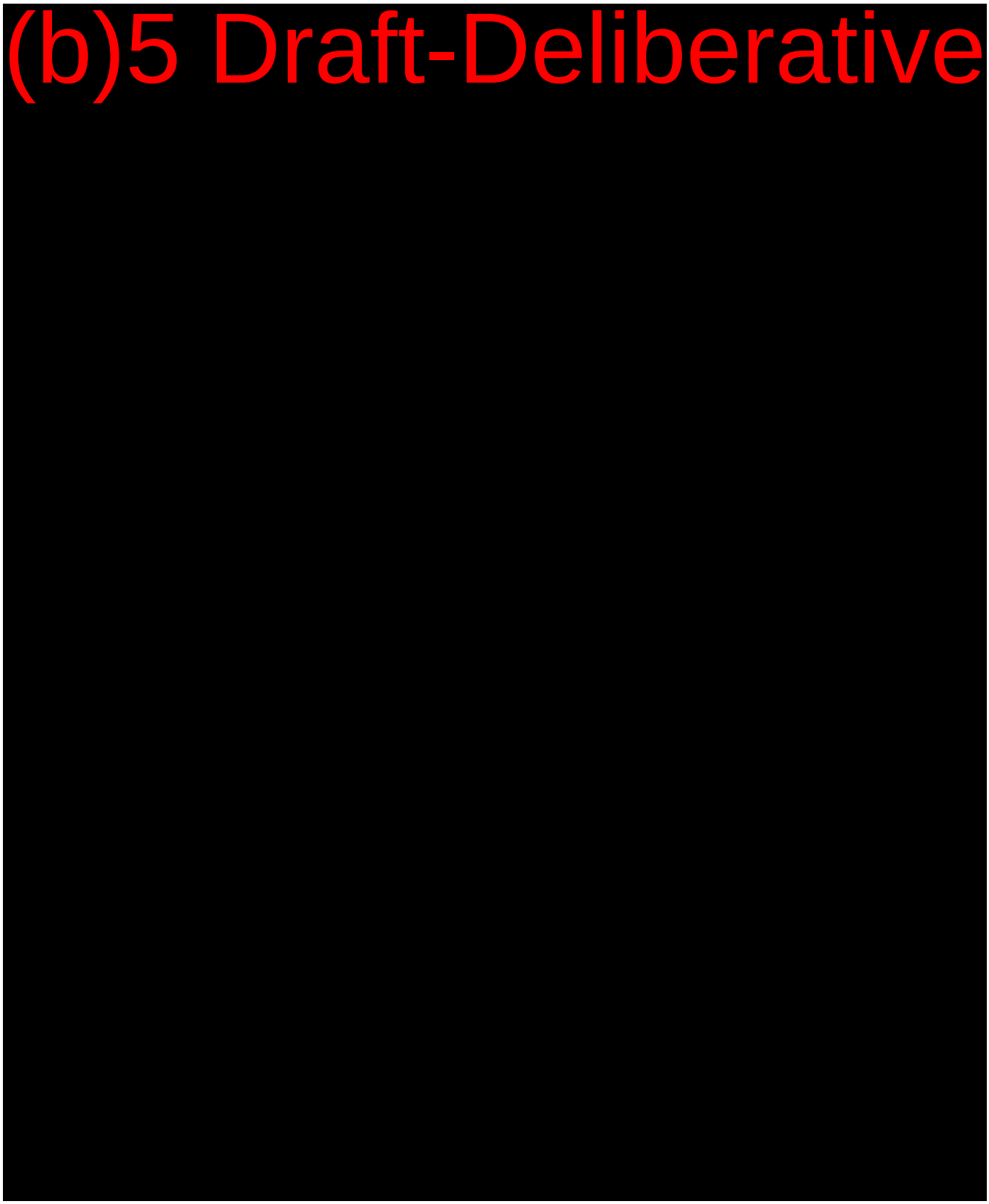

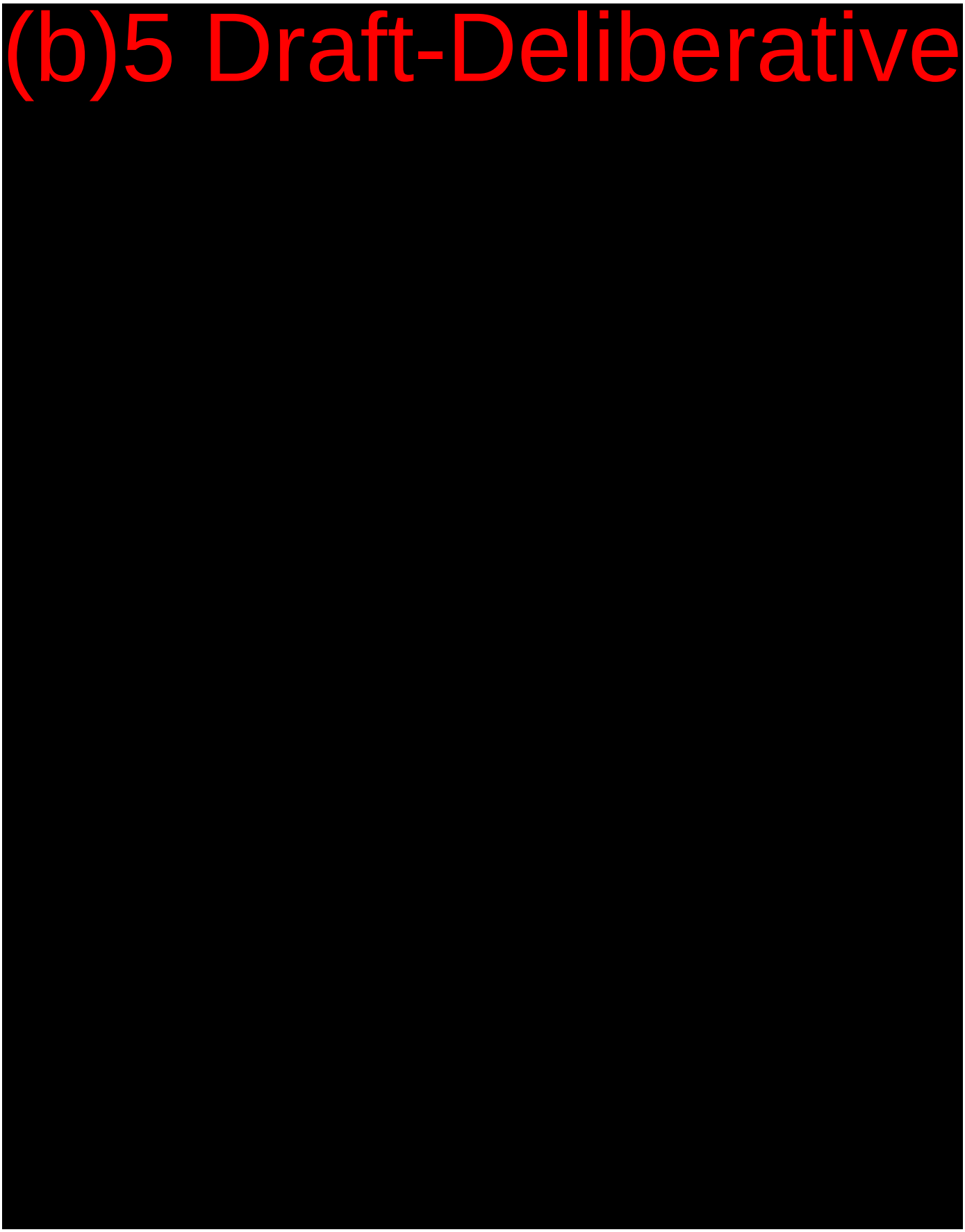
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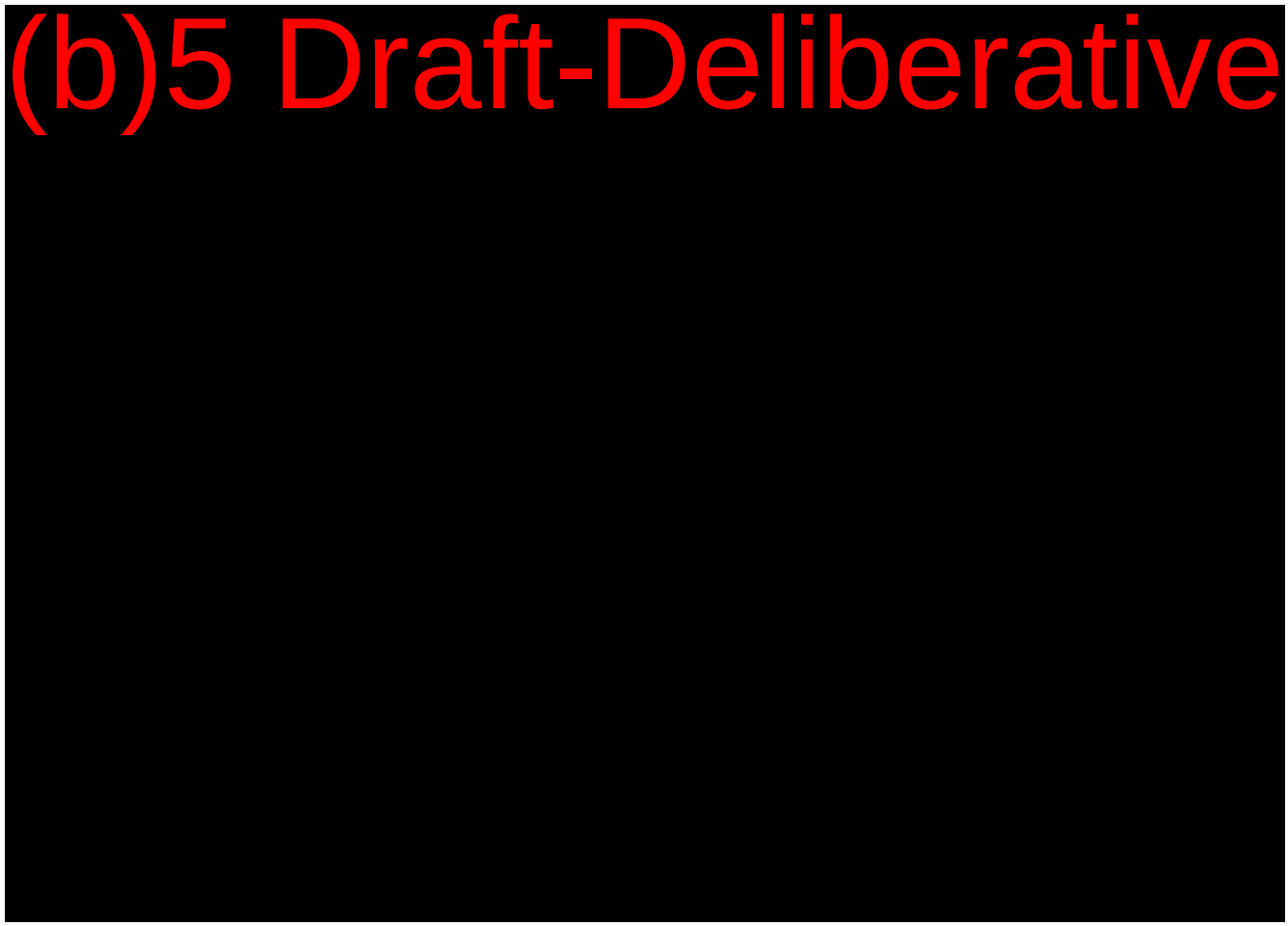

Yellowstone bison are one of only a few unfenced, wild, wide-ranging populations of plains bison in existence. They move across extensive portions of the unique landscape within and near YNP, with a full suite of native ungulates and predators, while being exposed to natural selection factors (Plumb et al. 2009, White et al. 2015b). Within the interior of the park, bison live in an environment not dominated by humans and whose behaviors, movements, survival, and reproduction are predominantly affected by their own daily decisions and natural selection (White 2016). As a result, Yellowstone bison have retained adaptive capabilities that are diminished in many other bison herds across North America managed like domesticated livestock in fenced pastures with human-induced seasonal movements among pastures, no predators, selective culling of older bulls to facilitate easier management, and selection for the retention of rare alleles—the function and importance of which have not been identified (McDonald 2001, White and Wallen 2012, White et al. 2015b).

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