

2025 Addendum to the 2021 Biological Assessment for Canada Lynx

**Effects of the 2009 Revised Forest Plan and the
Northern Rockies Lynx Management Direction
in response to the Beaverhead-Deerlodge Forest
Plan Amendment for Canada Lynx Habitat**

Prepared by:
Jennifer Gatlin
Wildlife Program Manager

for:
Beaverhead-Deerlodge National Forest

August 14, 2025

We make every effort to create documents that are accessible to individuals of all abilities; however, limitations with our word processing programs may prevent some parts of this document from being readable by computer-assisted reading devices. If you need assistance with any part of this document, please contact the Beaverhead-Deerlodge National Forest at 406-683-3900.

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the State or local Agency that administers the program or contact USDA through the Telecommunications Relay Service at 711 (voice and TTY). Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Mail Stop 9410, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

Table of Contents

Introduction	1
Need for Re-assessment Based on Changed Conditions.....	2
Consultation History	2
Determination of Effects.....	3
Best Available Science Considered in this Addendum	4
Olson et al. 2021	4
Additional Information for the 2021 Lynx Biological Assessment	5
Assumptions.....	5
Exceptions and Exemptions Established in the 2021 Biological Assessment.....	6
Olson et al. 2021	6
Western Lynx Biology Team Spatial Framework	12
Summary	17
References	18
Appendix A. Methods and Data Sources Used In this Addendum.....	20
Data Sources	20
Methodology	21
Lynx Habitat Excluded from Calculations	24
Appendix B. Figure and Map Package	27

Tables

Table 1. Current status of exception and exemption areas for Canada Lynx on the Beaverhead-Deerlodge National Forest.	6
Table 2. Area within the Beaverhead-Deerlodge National Forest administrative boundary that contains moderate and high habitat probabilities as modeled by Olson et al. 2021.	7
Table 3. LAUs on the Beaverhead-Deerlodge National Forest with relative probability habitat modeled by Olson et al. 2021 that fall outside of the LAU boundary.....	8
Table 4. Northern Rockies Lynx Management Direction habitat structural stages within Olson et al. 2021 high and moderate habitat probabilities.....	10
Table 5. Lynx habitat that could be utilized under exemption or exception acres that overlap with Olson et al. 2021 high and moderate habitat probabilities.	12
Table 6. Area within the Beaverhead-Deerlodge National Forest administrative boundary that contains lynx management tiers as modeled by the Western Lynx Biology Team spatial framework.	14
Table 7. LAUs on the Beaverhead-Deerlodge National Forest with management tiers modeled by the Western Lynx Biology Team that fall outside of the LAU boundary.	14
Table 8. Northern Rockies Lynx Management Direction habitat structural stages within Western Lynx Biology Team Tier 2 and 3 polygons.....	15
Table 9. Lynx habitat that could be utilized under exemption or exception acres that overlap with Western Lynx Biology Team Tier 2 and 3 polygons. This is not calculated at the 6 percent level.	16
Table 10. LAUs on the Beaverhead-Deerlodge National Forest with relative probability habitat modeled by Olson et al. 2021 that occur adjacent to a neighboring forest's LAUs.....	25

Table 11. LAUs on the Beaverhead-Deerlodge National Forest with management tier polygons modeled by the Western Lynx Biology Team Spatial Framework that occur adjacent to a neighboring forest's LAUs.....	26
---	----

Figures

Figure 1. Edge-matching issues when comparing Olson et al. 2021 and the Western Lynx Biology Team Spatial Framework to 2020 Lynx Analysis Units and lynx habitat on the Beaverhead-Deerlodge National Forest. Areas in red were not included as part of “habitat on the Forest” because they overlapped with a Lynx Analysis Unit on an adjacent forest. Areas in green are included because they are outside of Lynx Analysis Units on the Beaverhead-Deerlodge, but are still within the administrative boundary.	27
Figure 2. Olson et al. 2021 habitat probability overlap with lynx analysis units on the Beaverhead-Deerlodge National Forest.	28
Figure 3. Western Lynx Biology Team Spatial Framework tiers overlap with lynx analysis units on the Beaverhead-Deerlodge National Forest.	29

Introduction

This addendum supplements the 2021 Biological Assessment (BA) of the effects of the 2009 Revised Beaverhead-Deerlodge Land and Resource Management Plan (Forest Plan) on Canada lynx. (File M19 Beaverhead-Deerlodge National Forest; 06E1100-2021-0310 BDNF 2009 Forest Plan, Lynx occupied). This biological assessment was based on the 2020 Beaverhead-Deerlodge lynx habitat model and lynx analysis unit (LAU) delineations.

This addendum was prepared to consider new science about lynx habitat modeling that has been published after the above referenced Forest Plan consultation. Improved prediction of Canada lynx distribution through regional model transferability and data efficiency (Olson et al. 2021) and the Spatial Framework for the Conservation of Canada lynx Habitat in the Western U.S. and Associated Management Tiers (Interagency Western Lynx Biology Team 2022) are discussed in the addendum which discloses acreage overlap between 2020 Lynx Analysis Units and these habitat models. The Forest is currently analyzing the effects of updating where wildlife standard 7¹ applies by proposing to amend the Forest Plan to apply the BDNF 2020 lynx habitat model and LAU delineations.

This document does not address effects to the Canada lynx (*Lynx canadensis*) from the lynx amendment because effects from the Forest Plan and the Northern Rockies Lynx Management Direction (NRLMD) (USFS 2007b) were already disclosed as part of the 2021 BA. The previous biological assessment used the 2020 updated lynx habitat maps and lynx analysis units (LAUs) on the Beaverhead-Deerlodge National Forest (BDNF) to disclose potential effects to this species. There are no changes to the effects disclosed in the original assessment.

However, recent science that adds to our understanding of lynx habitat has been published since the 2021 Biological Assessment. The BDNF intends to use this new information in conjunction with wildlife standard 7 to analyze effects to Canada lynx at the project level. Although new science for species is regularly published, recent research improves our understanding of how lynx use landscapes. Therefore, the BDNF wanted to incorporate this information at the Forest Plan level to provide additional context for future project analyses.

A new Biological Assessment is not needed for the new science addressed in this document. Additional consultation would be required if new information reveals effects in a manner or to an extent not considered in the original 2021 Biological Assessment. The new science addressed in this document does not meet that standard but instead enhances our understanding of lynx habitat across the Forest. Effects to this species from activities identified in the BDNF Forest Plan would not change because of this information. A revised Biological Assessment may be prepared for this species if new information reveals effects in a manner or to an extent not considered in this assessment.

This addendum is programmatic in scope and only provides the framework for future site-specific actions that are subject to section 7 consultation. It does not authorize, fund, or

¹ The Northern Rockies Lynx Management Direction (2007) is included in Appendix G, and will apply to the BDNF as described in the Northern Rockies Lynx Management Record of Decision.

carry out future site-specific actions. Future project-level activities must be consistent with the direction in the Forest Plan and must undergo its own National Environmental Policy Act (NEPA) planning and decision-making procedures, including the appropriate ESA section 7 consultation.

Need for Re-assessment Based on Changed Conditions

An anticipated change in occupancy status based on verified lynx observations in 2017, 2018, and 2019 prompted the Forest to update the lynx habitat map and delineation of LAUs. This important change in occupancy status required application of the NRLMD whereas previously, as an unoccupied Forest, the NRLMD did not apply. Knowing that the initial mapping process overestimated lynx habitat and resulted in undersized LAUs, the Forest updated these products to produce the Alternative 2 habitat identification and LAU maps as identified in the lynx amendment. The NRLMD final environmental impact statement and biological opinion (USFS 2007c, FWS 2007a), the 3rd edition of the Lynx Conservation Assessment and Strategy (LCAS) (Interagency Lynx Biology Team 2013), and the 2016 Regional Forester's memo (Marten 2016) all encourage updates of habitat maps and LAU boundaries when better information is available.

Additional lynx science published after the 2021 Biological Assessment and Biological Opinion further refines preferred lynx habitat in the western United States. Research from Olson et al. (2021) provided a base for the Spatial Framework for the Conservation of Canada Lynx Habitat in the Western U.S. and Associated Management Tiers (spatial framework or framework) (Interagency Western Lynx Biology Team 2022). Both of these documents contain additional information regarding lynx habitat within the BDNF boundary. Mainly the modeled suitable habitat for this species is markedly reduced from previous estimates of preferred lynx habitat. Lynx are known to occur rarely or intermittently outside of areas that support resident populations and areas outside of suitable habitat (Interagency Western Lynx Biology Team 2022), so the BDNF will continue to consider effects to lynx, as appropriate, for project-specific analyses.

There are no on-the-ground changes on the BDNF proposed by considering Olson et al. 2021 and the framework when analyzing potential effects to lynx and lynx habitat. At the time of this writing, the BDNF cannot identify any effects not previously considered in the 2021 Biological Assessment. Therefore, this document focuses on the overlap and fit within the Olson et al. 2021 model, the spatial framework, and the 2020 updated mapping effort. This review does not trigger the requirement to re-initiate consultation on the Forest Plan.

Consultation History

In 2007, the Northern Region of the Forest Service formally consulted on the effects of the NRLMD on lynx (USFS 2007a). The NRLMD was amended to Land and Resource Management Plans, including the Beaverhead-Deerlodge National Forest. The Service concluded that the continued implementation of Forest Plans that incorporated the NRLMD may result in some adverse effects to lynx, although would not likely jeopardize the continued existence of lynx within the contiguous United States (FWS 2007b). For unoccupied Forests (as was the status of the Beaverhead-Deerlodge prior to September

2020), forest plans would be amended but the provisions of the NRLMD would not be implemented until these areas become occupied (ibid.).

The NRLMD was incorporated into the 2009 Revised Forest Plan as Wildlife Standard 7. However, effects to lynx were not consulted on at that time as lynx were not considered as “may be present” on the Forest. In 2013, the U.S. Fish and Wildlife Service determined lynx “may be present” on the Forest and updated the species list for the Forest to include lynx as a transient within secondary/peripheral lynx habitat (FWS 2013). In 2013, the USFWS assumed the 2007 consultation on the NRLMD to be sufficient to analyze effects to lynx on the Forest as the 2007 consultation included all National Forests in the action area, both occupied and unoccupied.

In 2019, the Forest informally consulted on the effects of implementing the 2009 Revised Forest Plan on Canada lynx because of a Montana District Court order (USFS 2019). The USFWS issued a letter of concurrence for a “may affect, not likely to adversely affect Canada lynx” determination. The 2019 assessment and concurrence determined effects to lynx from Forest management actions would be minimal and would not significantly affect how transient lynx would use habitat (FWS 2019).

In September 2020, based on recent lynx detections on the Forest, the Western Lynx Biology Team determined that the Forest met the provisions of “occupied” for lynx as defined in the 2006 Amended Conservation Agreement (USFS and FWS 2006). The WLBT recommended that all mapped lynx habitat on the Forest be considered “occupied” (ibid.) and used the updated habitat mapping and LAU delineation (BDNF 2020 lynx habitat map) in their recommendation of what parts of the BDNF would be considered “occupied.” This includes all mountain ranges except for the Tendoy and eastern portion of the Beaverhead Mountain ranges south of Highway 324 and south of Interstate 15. To be consistent with the BDNF Forest Plan Wildlife Habitat Standard 7 and Record of Decision for the NRLMD, the Forest was required to apply the NRLMD starting in September 2020, rather than only consider it.

With the change in lynx occupancy status from “unoccupied” to “occupied” on the Forest, the on-going effects of the BDNF Forest Plan to Canada lynx were reevaluated and analyzed in a January 2021 biological assessment (USFS 2021) and reviewed through consultation with the USFWS with a biological opinion received April 2021 (FWS 2021). This document incorporates the January 2021 biological assessment and April 2021 biological opinion by reference and provides additional information for that analysis. The 2021 Biological Opinion established surrogate measures of take for Canada lynx based off the 2020 mapping effort.

The Forest will continue to analyze lynx at the project level and disclose effects to this species and habitat, as appropriate. The science considered in this addendum may also be considered in future project analyses to further explain effects to lynx.

Determination of Effects

There is no change from the original determination of “may affect, is likely to adversely affect” the Canada lynx when applying the NRLMD management direction in conjunction with existing direction in the 2009 Forest Plan, even when considering additional lynx

science. The proposed action was not modified based on new science. Similarly, there is no effect to Canada lynx designated Critical Habitat as none exists on the BDNF.

Best Available Science Considered in this Addendum

Despite additional winter surveys, the BDNF has not detected any additional lynx beyond what was reported in the 2021 Biological Assessment despite intensive survey efforts in 2021 and 2024. A private resident detected a lynx using a trail camera on the Madison Ranger District in 2022. Similarly, Montana Fish, Wildlife, and Parks surveyed for lynx in two cells on the Forest in winter of 2024-2025 and no lynx were detected. At the time of this writing, the BDNF is not aware of any current resident lynx. The resident male previously identified on the Pintler Ranger District has not been detected in recent years. It is possible another lynx may become a resident on the BDNF in the future although transient individuals are more likely.

In addition, structural stages on the forest may have changed slightly since 2021. However, these changes are identified and reported during project-specific analysis. The forest-wide structural stage analysis was part of the 2020 lynx mapping update and project areas will be ground-verified for lynx habitat as part of site-specific analyses. The structural stage model is then updated based on this information.

The U.S. Fish and Wildlife Service Species Status Assessment (SSA) for Canada Lynx identified six SSA geographic units in the contiguous United States with strong historical or recent evidence of resident lynx populations (FWS 2023, 2017). These geographic units are used to evaluate the current and future conditions for lynx within areas that may support populations. Most of the Beaverhead-Deerlodge National Forest is outside of these geographic units, although a portion of the Northern Rockies SSA geographic unit overlaps with the Pintler Ranger District (609,515 acres). Twenty-two LAUs overlap with this geographic unit (Figure 2; Figure 3). Due to this overlap, additional information specific to the Pintler Ranger District is provided for both Olson et al. 2021 and the Western Lynx Biology Team spatial framework.

Olson et al. 2021

Olson et al. (2021) developed a Canada lynx distribution model based on GPS locations of lynx locations in the northwestern United States from habitat attributes selected by the animals. In general, both abiotic and biotic attributes of places where lynx selected were compared against random locations to predict the probability of lynx presence. This allows inferences to be made for places where lynx have not been detected based on the suitability of the existing habitat, which resulted in a continuous surface map of lynx habitat potential ranking from low to high.

Olson et al.'s habitat probability map is a coarse-filter (250-meter raster cells) at a large scale (multiple states and Canada). Due to the nature of this model, it is challenging to apply at finer scales, such as project-specific analyses for lynx (Olson pers. comm., June 30 2025). However, the overall application of this model suggests that conservation actions

should be focused within high-probability lynx habitat, which represents a significant reduction of areas that were previously identified as potentially important to lynx in the NRLMD (USFS 2007b, Interagency Western Lynx Biology Team 2022).

In general, the areas with varying probability classifications support lynx in different ways. Areas with high relative habitat probability are capable of supporting lynx production, moderate areas could be used by resident or transient lynx but are not likely to be used until the “high” areas are occupied, and low would not support this species over the long-term, but lynx may disperse through. Although lynx are excellent dispersers and may cross large, open areas (low probability habitat), there is no biological reason to provide lynx habitat protections for areas outside of the high and moderate probability areas (Olson pers. comm., June 30, 2025). Only acreages for high and moderate habitats are disclosed in this document because low relative probability areas do not contain the biotic or abiotic requirements necessary to support lynx, although disturbance effects in these areas are possible to transient individuals (analyzed at the project level).

Additional Information for the 2021 Lynx Biological Assessment

Data sources and methodology used to calculate this information is disclosed in Appendix A. Methods and Data Sources Used In this Addendum.

Assumptions

1. All numbers calculated using the process described below are considered estimates for acreages with rounding errors and possible topology issues.
2. Acreage calculations for lynx habitat may not represent on-the-ground conditions (e.g., acres currently modeled as “mature; multi-storied may be a different structural stage when surveyed). The BDNF updates the structural stage model after field verification occurs.
3. Raster-to-vector conversions, as occurred with Olson et al. 2021 model, may result in some data smoothing. This conversion may cause some degradation of data resulting in mis-aligned edges (e.g. “stairsteps”) that are formed when coarse raster pixels are converted to vectors. For the process used in this document, data were not simplified to maintain the original complexity to the best possible extent.
4. Course-filter models, such as Olson et al. 2021, are not designed for project-specific analysis but rather indicate areas that are capable of supporting lynx (Olson pers. comm., June 30, 2025).
5. Edge mapping discrepancies from raster-to-vector conversions may cause some inaccuracies for acreage calculations. The BDNF recognized this is possible and some acres reported as “outside of LAUs but within the BDNF boundary” likely line up well with the administrative boundary. However, this information was still included as part of acreages outside of LAUs, unless the polygon was adjacent to a neighboring forest’s LAU (Figure 1).

6. Edge-mapping discrepancies may also cause an over-estimation of areas that are adjacent to another Forest's LAU or are outside of LAUs established on the Beaverhead-Deerlodge. However, this effort represents the most conservative estimation of acreages based on overlapping polygons.

Exceptions and Exemptions Established in the 2021 Biological Assessment

Levels of incidental take are quantified using surrogate measures in the form of exemption and exception acres to the NRLMD vegetation treatments. Specifically, this equates to forest activities that remove lynx habitat within specific structural stages, specifically stand initiation and multi-story mature habitat. Claiming exemption (WUI under VEG S5 and S6) or exception acres (all others specified under VEG S5 and S6) occurs when a Forest utilizes the categories that permit lynx or hare habitat removal under specific circumstances.

Exemption acres under VEG S5 and VEG S6 for WUI apply across the category, meaning a maximum of 88,910 acres can apply to either VEG S5 or VEG S6 WUI treatments as long as the total number of acres is not exceeded. Similarly, the total of 6,115 acres for VEG S5 and 390 acres for VEG S6 for other categories, such as research, aspen, administrative sites, etc., can apply to any of the subcategories within these standards as long as treatments do not occur on more than 390 acres.

The BDNF reports exemption and exception acres annually as part of the 2021 Biological Opinion. Justification for the acres in each category is described in the 2021 Biological Assessment, Appendix D (USFS 2021). New projects reflect the location and amount of exemption and exception acres in addition to those used in other projects. As of 2024, the BDNF has only used a small amount of the allocated acres (Table 1).

Table 1. Current status of exception and exemption areas for Canada Lynx on the Beaverhead-Deerlodge National Forest.

Exception/Exemption Category	Reporting Year Utilization (acres)	Area Permitted (acres)	Year-to-Date Areas Utilized (acres)	Remaining Area (acres)
VEG S5	25 ¹	6,115	25 ¹	6,090
VEG S6	0	390	0	390
WUI (VEG S5 and S6)	0	88,910	50 ²	88,860
Total	25	95,415	75	95,340

¹Rancho Deluxe (2024) – counted for year-to-date and reporting year.

²Basin Creek Butte (2023) – counted for year-to-date.

Exception and exemption acres were calculated for the BDNF using the 2020 mapping update. Potential overlaps with these acres and the Olson et al. 2021 and spatial framework models are also described, although it is noted that these are estimates due to data accuracy assumptions.

Olson et al. 2021

In some places, edge-matching errors caused small acre “patches” to fall outside of the BDNF boundary, but adjacent to another forest's LAUs (see explanation in Appendix A:

Methodology; Figure 1). This occurred on the Wisdom and Pintler Ranger Districts, which border the Bitterroot (BTNF), Salmon-Challis (SCNF), and the Lolo (LNF) National Forests. These high and moderate acres were not included as part of the BDNF “outside of LAU” calculations as these acres likely fall into the adjacent forest’s LAU. This occurred on 17 LAUs, which are described in Table 10 in Appendix A. Similarly, Olson et al. 2021 habitat model displayed patches within the Lima-Tendoy Mountain range, where there are no modeled LAUs (Figure 2). These were also not included in the BDNF forest calculations because this area is extremely small and isolated, so it would not support resident lynx. Patches where the adjacent forest does not have a LAU are still included in the BDNF high and moderate calculations, although many of these areas are less than an acre and disconnected from other habitat polygons.

The BDNF contains high, moderate, and low habitat as modeled under Olson et al. 2021. Only moderate and high habitats are described here because there is no biological reason to provide habitat protections for low probability areas due to the inability for those habitats to support resident lynx (Olson pers. comm., June 30, 2025). The BDNF contains 1,748,132 acres of moderate and high habitat, of which 86 percent is moderate (Table 2). In general, there are more acres of moderate and high habitat within LAUs than outside of LAUs with only 1 percent (20,406 out of a total of 1,748,132 acres) of both types of relative probability habitat occurring outside of LAUs (Table 2).

Part of the Pintler Ranger District also overlaps with a portion of the Northern Rockies geographic unit which is used to evaluate current and future ecological requirements for resident lynx (FWS 2023, 2017) (Figure 2). Of the portion of the Northern Rockies geographic unit that overlaps with the BDNF (a total of 609,515 acres), 64 percent (389,782 acres) consists of high and moderate habitat probabilities. Only one percent of the high and moderate habitat probability areas fall outside of LAUs within this geographic area (Table 2).

Table 2. Area within the Beaverhead-Deerlodge National Forest administrative boundary that contains moderate and high habitat probabilities as modeled by Olson et al. 2021.

Olson et al. 2021 Habitat Probability	Area within LAUs (acres/percent)	Area outside LAUs (acres/percent)	Total (acres/percent)	Area outside BDNF LAU but adjacent to another forest LAU ^a (acres/percent)	Olson et al. 2021 within Lima Tendoy ^{a,b} (acres)
<i>Within the BDNF Administrative Boundary</i>					
High	243,415 / 14	417 / 2	243,832 / 14	136 / 58	0
Moderate	1,484,311 / 86	19,988 / 98	1,504,300 / 86	99 / 42	1,127
Total	1,727,726 / 99	20,406 / 1	1,748,132 / 100	235	1,127
<i>Within the Northern Rockies geographic unit</i>					
High	103,166 / 27	392 / 8	103,558 / 27	111 / 80	N/A
Moderate	281,698 / 73	4,526 / 92	286,223 / 73	28 / 20	N/A
Total	384,863 / 99	4,918 / 1	389,782	139	N/A

^aThese calculations are not included as part of the total for “areas outside LAUs” on the BDNF. They are further described in Appendix A.

^b1,127 acres of moderate habitat probability fall within the Lima-Tendoy mountains but are outside of BDNF LAUs. There are 16 patches ranging from 15.4 to 479 acres. The closest LAU is LT-02, located approximately 42 km (26 miles) to the northwest.

The BDNF recognizes that the 2020 updated lynx mapping effort identified 1,625,806 acres of lynx habitat across the BDNF within 78 LAUs. This is 101,920 acres fewer than the total number of moderate and high relative probability as modeled by Olson et al. 2021. However, only one percent of the Olson model falls outside of the 2020 LAUs (Table 2), with a majority of the acres on the edge or between LAUs. The largest moderate relative probability lies between GR-04 and GR-03 on the Madison Ranger District (approximately 3,750 acres, combining polygons) and the largest high probability patch is on the Pintler Ranger District is east of URC-03 and consists of 246 acres (Figure 2). Despite this difference in acres, the BDNF model coincides well with the Olson model and identifies lynx habitat on the BDNF (Olson pers. comm. June 30, 2025).

Table 3 displays the remainder of the high and moderate polygon patches where Olson et al. 2021 modeled habitat contains habitat outside of the LAU, but within the BDNF boundary, excluding those patches described in Appendix A. All of these patches are within 2,200 meters of a LAU boundary. Patches were associated with the closest LAU. Of the 78 LAUs on the BDNF, 55 are associated with Olson et al. 2021 high or moderate relative probability habitat outside of the LAU boundary (Table 3).

Table 3. LAUs on the Beaverhead-Deerlodge National Forest with relative probability habitat modeled by Olson et al. 2021 that fall outside of the LAU boundary.

District	LAU with Olson et al. 2021 Habitat Probability Outside of Boundary ^a	Olson et al. 2021 Habitat Probability Adjacent to the LAU	Area Total (acres)
Wisdom	BH-06	moderate	112.5
Wisdom	BH-07 ^b	moderate	59.1
Wisdom	BH-08 ^b	moderate	<1
Wisdom	BH-09 ^b	high/moderate	High: 0.3 Moderate: 33.4
Wisdom	BH-10 ^b	moderate	2.5
Wisdom	BH-11 ^b	high/moderate	High: 1 Moderate: 0.1
Wisdom	BH-12 ^b	high/moderate	High: 0.2 Moderate: 208.0
Wisdom	BH-13 ^b	high/moderate	High: 0.5 Moderate: 129
Wisdom	BH-15 ^b	moderate	1.5
Wisdom	BH-16	moderate	2.6 acres
Wisdom	BH-17	moderate	41.5 acres
Wisdom	BH-18	moderate	2.4
Dillon	BH-19	high/moderate	High: 1.8 Moderate: 2.0
Dillon	BH-20	moderate	458.5
Butte	BR-01	high/moderate	High: 2.0 Moderate: 13.1
Butte	BR-02	moderate	34.1
Butte	BR-03	moderate	723

District	LAU with Olson et al. 2021 Habitat Probability Outside of Boundary ^a	Olson et al. 2021 Habitat Probability Adjacent to the LAU	Area Total (acres)
Butte	BR-04	moderate	205.4
Butte	BR-05	moderate	16.2
Pintler	CFF-01	moderate	1,927.9
Pintler	CFF-02	moderate	12.8
Pintler	CFF-05	moderate	130.2
Pintler	CFF-07	moderate	4.0
Pintler	CFF-08	moderate	61.9
Pintler	CCF-09	moderate	34.3
Butte	CCF-10	moderate	296.2
Madison	GR-01 ^c	moderate	1,642.2; adjacent to GR-03
Madison	GR-02	moderate	159.1
Madison	GR-03 ^c	moderate	4,376.1; most adjacent to GR-04
Madison	GR-04 ^c	moderate	3,362.4 some adjacent to GR-03
Madison	GR-05	moderate	233.8
Madison	GR-07	moderate	60.1
Madison	GR-08	high/moderate	High: 2.8 Moderate: 172.9
Butte	JR-01	moderate	645
Butte	JR-02	moderate	1.8
Dillon	LT-01	high/moderate	High: 0.8 Moderate: 0.7
Dillon	LT-02	moderate	157.7
Madison	MAD-01	moderate	184.4
Madison	MAD-02	moderate	403.2
Madison	MAD-03	moderate	388.1
Wisdom	PIO-06	moderate	1.1
Dillon	PIO-11	moderate	48.6
Wisdom	PIO-12	moderate	10.0
Dillon	PIO-14	moderate	15.4
Butte	TR-01	moderate	137.2
Madison	TR-03	moderate	860.3
Pintler	URC-01 ^b	high/moderate	High: 17.8 Moderate: 637.6
Pintler	URC-02 ^b	high/moderate	High: <1 Moderate: 123.6
Pintler	URC-03 ^b	high/moderate	High: 374.4 Moderate: 545.8

District	LAU with Olson et al. 2021 Habitat Probability Outside of Boundary ^a	Olson et al. 2021 Habitat Probability Adjacent to the LAU	Area Total (acres)
Pintler	URC-04 ^b	high/moderate	High: 2.5 Moderate: 1.9
Pintler	URC-05 ^b	high/moderate	High: 0.2 Moderate: 574.8
Pintler	URC-06 ^b	high/moderate	High: 7.1 Moderate: 10.0
Pintler	URC-07	moderate	463.8
Pintler	URC-08 ^b	high/moderate	High: 6.1 Moderate: <1
Pintler	URC-09 ^b	moderate	4.3

^aHabitat probability outside of the LAU boundary is subject to edge-mapping errors due to raster-to-vector conversions. Refer to Appendix A for the calculation methods for these metrics.

^bLAU with relative probability polygons that occur along an adjacent Forest's LAU. Refer to Appendix A, Table 10 for this information.

^cHabitat probability for this LAU also touches an adjacent LAU on the BDNF and is described in the comments.

All structural stages identified in the NRLMD (early stand initiation [ESI], stand initiation [SI], stand exclusion [SE], mature, multi-storied [MMS], and other) overlap with moderate and high habitat probabilities (Table 4). However, not all acres within the moderate and high relative probabilities are modeled as structural stages as defined by the NRLMD. Structural stages do change over time based on treatments and natural events (windfall, wildfire, etc.), thus the numbers presented in this document are not static but best represent the information to date. The BDNF does not have structural stages modeled for areas outside of the 2020 LAU boundaries so there is no information for the overlap between stand structure and moderate and high habitat probabilities outside of LAUs. Most of the lynx habitat within high and moderate within LAUs is considered “other” (45 percent), followed by mature, multi-storied (24 percent), and stem exclusion (17 percent) (Table 4). Likewise, most of the lynx habitat within the Northern Rockies geographic unit is similar, with the “other” structural stage consisting of 45 percent of the available lynx habitat (Table 4).

Table 4. Northern Rockies Lynx Management Direction habitat structural stages within Olson et al. 2021 high and moderate habitat probabilities.

Habitat Structural Stage	Olson et al. 2021 High Habitat Probability (acres/percent)	Olson et al. 2021 Moderate Habitat Probability (acres/percent)	Total (acres/percent)
<i>Within the BDNF Administrative Boundary</i>			
Early Stand Initiation	14,281 / 7	106,508 / 11	120,788 / 10
Stand Initiation	8,633.6 / 4	37,990 / 4	46,623 / 4
Stem Exclusion	39,524 / 20	161,653 / 17	201,177 / 17
Mature, Multi-Storied	42,232 / 21	230,954 / 24	273,187 / 24
Other	94,217 / 47	438,849 / 45	533,066 / 45
Total	198,886 / 17	975,955 / 83	1,174,841
<i>Within the Northern Rockies geographic unit</i>			

Habitat Structural Stage	Olson et al. 2021 High Habitat Probability (acres/percent)	Olson et al. 2021 Moderate Habitat Probability (acres/percent)	Total (acres/percent)
Early Stand Initiation	6,955 / 8	28,763 / 14	35,719 / 12
Stand Initiation	3,298 / 4	6,940 / 4	10,238 / 4
Stem Exclusion	7,113 / 8	17,122 / 9	24,235 / 8
Mature, Multi-Storied	13,703 / 16	37,129 / 19	50,833 / 18
Other	55,891 / 64	108,316 / 54	164,206 / 58
Total	86,960 / 30	198,271 / 70	285,231

Some lynx habitat that overlaps with high and moderate lynx habitat probability may also be treated under exemptions and exception acres. Calculations of these acres only involves structural stages within stand initiation and mature, multi-storied habitats, as these can support lynx and hares year-round.

Wildland-Urban Interface areas that could be treated under exemptions (described in Appendix A) overlaps with 22,733 acres of high and 99,418 acres of moderate probability as modeled by Olson et al. 2021 (Table 5). This equates to 10 percent of the available lynx habitat in both high and moderate areas across the forest (122,151 out of 1,174,841 acres) if every acre was utilized. However, the BDNF is limited to only treating 6 percent of lynx habitat (stand initiation and mature, multi-storied) under these exemptions. However, the Biological Opinion establishes maximum incidental take allowances. Only 88,860 acres of MMS and SI habitats within WUI can be removed, which means an additional 33,291 acres within the WUI would remain unchanged. The WUI exemption maximum would result in only treating up to 8 percent of the total available lynx habitat in moderate and high probability areas across the entirety of the Forest. This is above the exemption rule of 6 percent of the mapped lynx habitat within an administrative boundary. However, we note that the Olson et al. 2021 model is not intended for project-specific analysis at this fine of a scale (Olson pers. comm., June 30, 2025).

Exceptions (VEG S5 – administrative sites, research or genetic testing, aspen, whitebark pine; VEG S6 – research, and salvage) acres may also be used that overlap with Olson et al. 2021 moderate and high habitat probabilities. Each of these categories have established acres (Table 1) that the Forest will not exceed. It is not possible to calculate the number of acres within each exception category that overlaps with Olson et al. 2021 because these acres are utilized for specific project types. However, we estimate that the overlap between places where exception acres could be utilized (as described in Appendix A) and Olson et al. 2021 moderate and high probability habitats is 28,133 (high) and 169,522 acres (moderate) (Table 5) on the entirety of the Forest.

Exceptions for non-WUI categories could alter up to 197,655 acres of high and moderate relative habitat probabilities (17 percent) of the available lynx habitat (197,655 out of 1,174,841 acres) (Table 5). However, only 6,480 acres of SI and MMS can be removed under exceptions categories (based on the Biological Opinion), which represents 3 percent of the total acres that could be treated (197,655 acres). Overall, 191,175 acres of lynx habitat that could be treated under exception categories would remain unchanged. Treating a maximum

of 6,840 acres equates to less than 1 percent of lynx habitat within moderate and high relative habitat probabilities.

Table 5. Lynx habitat that could be utilized under exemption or exception acres that overlap with Olson et al. 2021 high and moderate habitat probabilities.

Exemption/Exception	Olson et al. 2021 High Habitat Probability (acres/percent)	Olson et al. 2021 Moderate Habitat Probability (acres/percent)	Total (acres/percent)
<i>Within the BDNF Administrative Boundary</i>			
VEG S5 and VEG S6: WUI (SI and MMS; 6% of mapped lynx habitat within an administrative boundary	22,733 / 45	99,418 / 37	122,151 / 38
VEG S5 and VEG S6: non-WUI (SI and MMS; within 200 feet of administrative sites, aspen, whitebark pine, research, salvage)	28,133 / 55	169,522 / 63	197,655 / 62
Total	50,866 / 16	268,940 / 84	319,806
<i>Within the Northern Rockies geographic unit</i>			
VEG S5 and VEG S6: WUI (SI and MMS; 6% of mapped lynx habitat within an administrative boundary	8,449 / 29	21,172 / 72	29,621 / 48
VEG S5 and VEG S6: non-WUI (SI and MMS; within 200 feet of administrative sites, aspen, whitebark pine, research, salvage)	8,552 / 27	22,897 / 73	31,450 / 52
Total	17,001 / 28	44,069 / 72	61,071

It is extremely unlikely the BDNF would utilize all of the available acres as displayed in Table 5. Not all of the available SI or MMS habitats that overlap with Olson et al. high and moderate probability areas could be treated due to the permitted amounts established in the biological opinion (Table 1).

Western Lynx Biology Team Spatial Framework

The spatial framework (Interagency Western Lynx Biology Team 2022) relied on Olson et al. (2021) to identify high quality lynx habitat, or habitat areas that would provide the highest conservation value for lynx. The framework refined and reduced the area where the WLBT thinks management direction to conserve/recover lynx populations is appropriate by 40 to 50 percent compared to existing maps of lynx habitat across the Northern Rockies. This is not considered best available science because it is not original peer-reviewed research but instead provides another refinement of the Olson et al. 2021 model to make recommendations for lynx conservation. At this time, the WLBT framework is not considered direction and does not replace the standards in the NRLMD.

The framework identifies management tiers as an indicator of habitat suitability based on Olson et al. (2021), which provides a predictive relative probability of lynx presence. The framework does not identify where lynx occupancy occurs but rather discloses areas with

high probabilities of suitable habitat. Actual on-the-ground conditions may not have the structural stages needed to support lynx (such as high horizontal cover) although the Olson model suggests the biotic and abiotic conditions may be present for this species (Interagency Western Lynx Biology Team 2022).

The spatial framework groups lynx habitat into tiers based on habitat quality. Tier 1 areas include habitat with the highest potential for supporting long-term occupancy and reproduction and established lynx home ranges. Tier 2 areas include habitat with the potential to support lynx occupation and promote connectivity that is located between tier 1 habitat areas where periodic lynx occupancy and perhaps occasional reproduction is possible. Tier 3 would most likely support dispersing/transient individuals that may use the area as a stopover for foraging and shelter during long dispersal movements. Areas outside of tiers may be used very rarely by actively dispersing individuals.

Desired vegetation structural characteristics at the lynx home range scale are also described in the spatial framework. Definitions and amounts for stand initiation, sparse, advanced regeneration, and mature habitats were derived from Holbrook et al. (2017, 2019). Although the spatial framework provides recommendations for desired vegetation structural mosaics for Canada lynx conservation, it does not replace comprehensive lynx conservation strategies that include wildland fire and climate influences. Because this component of lynx habitat is dynamic and spatial framework recommendations do not replace Forest Plan standards (such as the incorporation of NRLMD structural stage standards for lynx analysis units), vegetation characteristics are disclosed at the project level.

Similar to Olson et al. 2021, edge-matching errors occurred when clipping framework tiers to LAUs and the Forest administrative boundary (Figure 1). For the spatial framework tiers, this occurred on 13 out of 78 LAUs (Table 11 in Appendix A) in the Wisdom, Butte, and Pintler ranger districts. These LAUs border other LAUs on the following neighboring forests: Bitterroot, Salmon-Challis, and the Lolo.

Within the administrative boundary, the spatial framework identifies 13 separate tier polygons with patches of tiers 2 and 3, totaling 791,160 acres. In general, framework management tiers overlap with just under one hundred percent (99.7 percent) of the LAUs on the Forest (Table 6; Figure 3). The majority of the BDNF consists of tier 2 (91 percent), with 1,623 and 159 acres of tier 2 and 3, respectively, that are outside of LAUs but within the administrative boundary (Table 6). 190 acres of tier 2 falls outside of LAU boundaries but are adjacent to another forest (Table 6). Of the portion of the Northern Rockies geographic unit that overlaps with the BDNF (a total of 609,515 acres), 45 percent (273,975 acres) consists of tier 2 with the remaining area outside of tiers. Only 1 percent of tier 2 (1,568 acres) falls outside of LAUs within this geographic area (Table 6). 124 acres are within an adjacent forest's LAUs.

Table 6. Area within the Beaverhead-Deerlodge National Forest administrative boundary that contains lynx management tiers as modeled by the Western Lynx Biology Team spatial framework.

WLBT Spatial Framework Management Tier	Area within LAUs on the BDNF (acres/percent)	Area outside LAUs on the BDNF (acres/percent)	Total (acres/percent)	Area outside BDNF LAU but adjacent to another forest LAU ^a (acres/percent)	WLBT Spatial Framework in Lima Tendoy ^a (acres)
<i>Within the BDNF Administrative Boundary</i>					
1	0 / 0	0 / 0	0 / 0	0 / 0	0
2	715,103 / 91	1,623 / 93	716,770 / 91	190 / 100	0
3	74,271 / 9	159 / 7	74,390 / 9	0 / 0	0
Total	789,374 / 100	1,782 / <1	791,160	190	0
<i>Within the Northern Rockies geographic unit</i>					
1	0 / 0	0 / 0	0 / 0	0 / 0	0
2	272,407 / 100	1,568 / 1	273,975 / 100	124 / 100	0
3	0 / 0	0 / 0	0 / 0	0 / 0	0
Total	272,407 / 99	1,568 / 1	273,975 / 100	124 / 100	0

^aThese calculations are not included as part of the total for “areas outside LAUs” on the BDNF. They are further described in Appendix A.

Table 7 displays the remainder of the Tier 2 and 3 polygon patches where the WLBT framework management tiers fall outside of LAUs but are within the BDNF boundary, excluding those patches described in Appendix A. All of these patches are within 225 meters of a LAU boundary. Patches were associated with the closest LAU, with some bordering an adjacent LAU. Of the 78 LAUs on the BDNF, 20 are associated with WLBT management tier polygons outside of the LAU boundary (Table 7). These patches range from less than 1 acre to 1,010 acres. The largest tier 2 patch is located on the eastern edge of URC-03, although the LAU touches both the northern and southern edges of this patch. There are no tier 3 polygons outside of LAUs on the BDNF.

Table 7. LAUs on the Beaverhead-Deerlodge National Forest with management tiers modeled by the Western Lynx Biology Team that fall outside of the LAU boundary.

District	LAU with WLBT Tier Outside of Boundary ^a	WLBT Tier Adjacent to the LAU	Area Total (acres)
Wisdom	BH-09 ^b	2	1.1
Wisdom	BH-10 ^b	2	0.9
Wisdom	BH-11 ^b	2	1.1
Wisdom	BH-12 ^b	2	3.0
Wisdom	BH-13 ^b	2	1.2
Wisdom	BH-18	2	<1
Wisdom	BH-19	2	1.9
Butte	BR-01	2	12.4
Butte	BR-02	2	0.1
Pintler	CFF-01 ^c	2	Patch between CFF-01 and URC-0; 407.7

District	LAU with WLBT Tier Outside of Boundary ^a	WLBT Tier Adjacent to the LAU	Area Total (acres)
Butte	JR-01	3	49.6
Dillon	LT-01	2	1.2
Madison	TR-03	3	109.6
Pintler	URC-01 ^{b,c}	2	100
Pintler	URC-02 ^b	2	49.2
Pintler	URC-03 ^b	2	1,010.3
Pintler	URC-04 ^b	2	5.9
Pintler	URC-05 ^b	2	7.9
Pintler	URC-06 ^b	2	12.0
Pintler	URC-08 ^b	2	6.1

^aManagement tier outside of the LAU boundary is subject to edge-mapping errors due to clipping polygons. Refer to Appendix A for the calculation methods for these metrics.

^bLAU with management tier polygons that occur along an adjacent Forest's LAU. Refer to Appendix A, Table 11 for this information.

^cManagement tier outside of the LAU also touches an adjacent LAU on the BDNF and is described in the comments.

All structural stages identified in the NRLMD overlap with Tier 2 and Tier 3 WLBT polygons (Table 8). However, not all acres within the WLBT polygons are modeled as structural stages as defined by the NRLMD. Structural stages do change over time based on treatments and natural events (windfall, wildfire, etc.), thus the numbers presented in this document are not static but best represent the information to date. The BDNF does not have structural stages modeled for areas outside of the 2020 LAU boundaries so there is no information for the overlap between stand structure and WLBT polygons outside of LAUs. Most of the lynx habitat within Tiers 2 and 3 within LAUs is considered “other” (44 percent), followed by mature, multi-storied (19 percent) and stem exclusion (18 percent) (Table 8). Likewise, a majority of the lynx habitat within the Northern Rockies geographic unit is similar, with the “other” structural stage consisting of 58 percent of the available lynx habitat (Table 8).

Table 8. Northern Rockies Lynx Management Direction habitat structural stages within Western Lynx Biology Team Tier 2 and 3 polygons.

Habitat Structural Stage	WLBT Spatial Framework Tier 2 (acres/percent)	WLBT Spatial Framework Tier 3 (acres/percent)	Total (acres/percent)
<i>Within the BDNF Administrative Boundary</i>			
Early Stand Initiation	77,055 / 14	4,493 / 9	81,548 / 13
Stand Initiation	31,486 / 6	1,407 / 3	32,893 / 5
Stem Exclusion	105,818 / 19	5,129 / 11	110,947 / 18
Mature, Multi-Storied	104,621 / 19	13,047 / 27	117,668 / 19
Other	245,041 / 43	23,564 / 49	268,605 / 44
Total	564,022 / 92	47,641 / 8	611,663 / 100
<i>Within the Northern Rockies geographic unit</i>			
Early Stand Initiation	25,004 / 12	0 / 0	25,004 / 12
Stand Initiation	7,820 / 4	0 / 0	7,820 / 4

Habitat Structural Stage	WLBT Spatial Framework Tier 2 (acres/percent)	WLBT Spatial Framework Tier 3 (acres/percent)	Total (acres/percent)
Stem Exclusion	18,248 / 9	0 / 0	18,248 / 9
Mature; Multi-Storied	36,731 / 17	0 / 0	36,731 / 17
Other	121,631 / 58	0 / 0	121,631 / 58
Total	209,434 / 100	0 / 0	209,434 / 100

Similar to Olson et al. 2021, there is some overlap between tier 2 and 3 polygons with VEG S5 and VEG S6 exemption acres for projects in the wildland-urban interface (as described in Appendix A). WUI areas where treatments could remove SI or MMS habitat overlap with 47,139 acres in Tier 2 and 6,545 acres in Tier 3 polygons (Table 9), which equates to 8 percent of the available lynx habitat within Tiers 2 and 3 (611,663 acres). The BDNF is limited to treating 6 percent of lynx habitat (stand initiation and mature, multi-storied structural stages) under these exemptions (88,910 acres) across the forest, as established in the Biological Opinion. If spatial framework tiers were the sole metric for describing lynx habitat, the Forest would be restricted to treating only 36,700 acres within tiers 2 and 3 (6 percent of 611,663).

Exceptions (VEG S5 – administrative sites, research or genetic testing, aspen, whitebark pine; VEG S6 – research, and salvage) acres may also be used that overlap with WLBT spatial framework tiered polygons. It is not possible to calculate the number of acres within each exception category that overlaps with the tiered polygons because these acres are utilized for specific project types. However, we estimate that the overlap between places where exception acres could be utilized and the spatial framework tiers is 88,968 and 7,909 acres for Tiers 2 and 3, respectively, for the entire Forest (Table 9). Exceptions for non-WUI categories could alter up to 96,877 acres of habitat within framework tiers 2 and 3 (Table 9). This represents 16 percent of available lynx habitat within tiers 2 and 3 (96,877 out of 611,663 acres) across the Forest. However, the Biological Opinion established that only 6,480 acres could be treated under exceptions. If all of the exception acres are utilized, 90,397 acres would remain unchanged within tiers 2 and 3. 6,480 acres is only 1 percent of the available lynx habitat within tiers 2 and 3 across the entire Beaverhead-Deerlodge National Forest.

Table 9. Lynx habitat that could be utilized under exemption or exception acres that overlap with Western Lynx Biology Team Tier 2 and 3 polygons. This is not calculated at the 6 percent level.

Exemption/Exception	WLBT Spatial Framework Tier 2 (acres/percent)	WLBT Spatial Framework Tier 3 (acres/percent)	Total (acres/percent)
<i>Within the BDNF Administrative Boundary</i>			
VEG S5 and VEG S6: WUI (SI and MMS; 6% of mapped lynx habitat within an administrative boundary)	47,139 / 35	6,545 / 45	53,684 / 36
VEG S5 and VEG S6: non-WUI (SI and MMS; within 200 feet of administrative sites, aspen, whitebark pine, research, salvage)	88,968 / 65	7,909 / 55	96,877 / 64
Total	136,107 / 90	14,454 / 10	150,561 / 100

<i>Within the Northern Rockies geographic unit</i>			
VEG S5 and VEG S6: WUI (SI and MMS; 6% of mapped lynx habitat within an administrative boundary)	20,903 / 47	0 / 0	20,903 / 47
VEG S5 and VEG S6: non-WUI (SI and MMS; within 200 feet of administrative sites, aspen, whitebark pine, research, salvage)	23,648 / 53	0 / 0	23,648 / 53
Total	44,551 / 100	0 / 0	44,551 / 100

It is extremely unlikely the BDNF would utilize all of the available acres as displayed in Table 9. Not all of the available SI or MMS habitats that overlap with Olson et al. high and moderate probability areas could be treated due to the permitted amounts established in the biological opinion (Table 1).

Summary

This addendum compares the Beaverhead-Deerlodge National Forest 2020 modeled lynx habitat with recently published landscape models by Olson et al. (2021) and the Western Lynx Biology Team (2022) and provides information on the overlap. Overall, both landscape models overlap well with the 2020 LAUs on the Beaverhead-Deerlodge National Forest. Approximately 99 percent of both landscape models are within 2020 LAUs (Table 2, Table 6).

These new landscape models increase our understanding of habitats that are important to lynx and may support existing or future populations. The BDNF will continue considering effects to this species for project-specific analysis under the NRLMD, as established in the Forest Plan, but will also use Olson et al. 2021 and the spatial framework to consider other potential habitat or individual effects.

References

- FWS, U.S. Fish and Wildlife Service. 2007a. Biological opinion on the effects of the Northern Rocky Mountains Lynx Amendment on the Distinct Population Segment (DPS) of Canada lynx (*lynx*) in the contiguous United States. 19 March. Helena, MT: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Ecological Services, Montana Field Office. 1-85 pp.
- FWS, U.S. Fish and Wildlife Service. 2007b. Effects of the northern Rocky Mountains lynx amendment on the distinct population segment (DPS) of Canada lynx (*Lynx canadensis*)(lynx) in the contiguous United States. Helena, MT: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Ecological Services, Montana Field Office. 125 p.
- FWS, U.S. Fish and Wildlife Service. 2013. Threatened, endangered and candidate species for the Beaverhead-Deerlodge National Forest, 7/2/2013. Helena, MT: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Ecological Services, Montana Field Office. 2 p.
- FWS, U.S. Fish and Wildlife Service. 2017. Species status assessment for the Canada lynx (*Lynx canadensis*) contiguous United States distinct population segment. Version 1.0. Lakewood, CO: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Regions 1, 3, 5 and 6. 292 p.
- FWS, U.S. Fish and Wildlife Service. 2019. Biological opinion for effects of 2009 Revised Forest Plan on Canada lynx for the Beaverhead-Deerlodge National Forest. July 2, 2019. U.S. Department of Interior, U.S. Fish and Wildlife Service (FWS), Montana Field Office. 3 p.
- FWS, U.S. Fish and Wildlife Service. 2023. Species status assessment addendum for the Canada lynx (*Lynx canadensis*) contiguous United States distinct population segment. Denver, CO: U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS), Regions 1, 2, 3, 5 and 6. 122 p.
- FWS, U.S. Fish and Wildlife Service,. 2021. Biological Opinion on the effects to Canada lynx (*Lynx canadensis*) from implementing the 2009 Revised Forest Plan and the Northern Rockies Lynx Management Direction (NRLMD) on the Beaverhead-Deerlodge National Forest. April 5, 2021. 06E11000-2021-F-0310. 53 p.
- Hanvey, G. 2020. Regional office review: Habitat mapping document for Canada lynx (*lynx canadensis*) on the Beaverhead-Deerlodge National Forest -2020. Missoula, MT: USDA Forest Service, Northern Region (R1). 1-40 pp.
- Holbrook, J.D., Squires, J.R., Bollenbacher, B., Graham, R., Olson, L.E., Hanvey, G., Jackson, S., Lawrence, R.L., and Savage, S.L. 2019. Management of forests and forest carnivores: Relating landscape mosaics to habitat quality of Canada lynx at their range periphery. *Forest Ecology and Management* 437: 411-425.
<https://doi.org/10.1016/j.foreco.2019.01.011>
- Holbrook, J.D., Squires, J.R., Olson, L.E., DeCesare, N.J., and Lawrence, R.L. 2017. Understanding and predicting habitat for wildlife conservation: the case of Canada lynx at the range periphery. *Ecosphere* 8(9): e01939.
<https://doi.org/10.1002/ecs2.1939>
- Interagency Lynx Biology Team. 2013. Canada lynx conservation assessment and strategy. 3rd ed. Date: August, 2013. Forest Service Pub. R1-13-19. Missoula, MT: U.S. Department of Agriculture, Forest Service (USDA Forest Service), U.S. Department of Interior, U.S. Fish and Wildlife Service (FWS), U.S. Department of Interior, Bureau

- of Land Management (BLM), and U.S. Department of Interior, National Park Service (NPS). 128 p. <https://www.fs.fed.us/biology/resources/pubs/wildlife/index.html>
- Interagency Western Lynx Biology Team. 2022. Spatial Framework for the Conservation of Canada Lynx Habitat in the Western U.S. and Associated Management Tiers. Date: December 2022. 51 p.
- Marten, L.M. 2016. Clarification on lynx habitat mapping in R1. Team, R.L. Missoula, MT, September 6.
- Olson, L.E., Bjornlie, N., Hanvey, G., Holbrook, J.D., Ivan, J.S., Jackson, S., Kertson, B., King, T., Lucid, M., Murray, D., Naney, R., Rohrer, J., Scully, A., Thornton, D., Walker, Z., and Squires, J.R. 2021. Improved prediction of Canada lynx distribution through regional model transferability and data efficiency. *Ecology and Evolution* 11(4): 1667-1690.
- USFS, USDA Forest Service. 2007a. Biological assessment (revised) of the northern Rockies lynx amendment on threatened, endangered and proposed vertebrate and invertebrate species (revision of BA dated November 18, 2005). Missoula, MT: Northern Region (R1). 104 p.
- USFS, USDA Forest Service. 2007b. Northern Rockies lynx management direction record of decision, national forests in Montana, and parts of Idaho, Wyoming, and Utah. Missoula, MT: Northern Region (R1). 71 p.
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd1106433.pdf
- USFS, USDA Forest Service. 2007c. Northern Rockies lynx management direction: Final environmental impact statement (vols. 1 and 2). Date: March. Missoula, MT: Northern Region (R1).
https://www.fs.usda.gov/wps/portal/fsinternet!/ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjAwhwtDDw9_AI8zPwhQoY6leDdGCqCPOBqwDLG-AAjgb6fh75uan6BdnZaY6OiooA1tkqlQ!!/dl3/d3/L2dJQSEvUUt3QS9ZQnZ3LzZfMjAwMDAwMDDDBODBPSEhWTjJNMDAwMDAwMDA!/?navtype=BROWSEBYSUBJECT&cid=stelprdb5160650&navid=1601200000000000&pnavid=1600000000000000&ss=1101&position=Not%20Yet%20Determined.Html&ttype=detail&pname=Region%201-%20Resource%20Management
- USFS, USDA Forest Service. 2019. Biological assessment for Canada lynx, effects of the 2009 revised forest plan, Beaverhead-Deerlodge National Forest. Series Editor: Roberts, A., ed. Date: June 19, 2019. Dillon, MT: Beaverhead-Deerlodge National Forest. 68 p.
- USFS, USDA Forest Service. 2021. Biological assessment for Canada lynx, effects of the 2009 revised forest plan and the northern Rockies lynx management direction. Series Editor: Gatlin, J., ed. Dillon, MT: Beaverhead-Deerlodge National Forest. 208 p.
- USFS, USDA Forest Service and FWS, U.S. Fish and Wildlife Service. 2006. Canada Lynx Conservation Agreement. U.S. Department of Agriculture, F.S. and U.S. Department of the Interior, F.a.W.S., eds. Washington, DC:

Appendix A. Methods and Data Sources Used In this Addendum

Data Sources

Beaverhead-Deerlodge Canada Lynx Analysis Units and Habitat – Developed during the process for updating Canada lynx LAUs and habitat on the Forest which concluded in 2020. The process was reviewed and approved by the Northern Region (Region 1) Regional Office of the Forest Service (Hanvey 2020).

Beaverhead-Deerlodge National Forest Boundary – an area encompassing all the National Forest System lands administered by the Beaverhead-Deerlodge National Forest. This encompasses private lands, other governmental agency lands, and may contain National Forest System lands within the proclaimed boundaries of another administrative unit.

Olson High/Moderate Habitat – Raster data obtained from Olson et al. (2021) and converted to vector (see process below).

Western Lynx Biology Team Spatial Framework Tiers 2 and 3 – polygons obtained from the Western Lynx Biology Team (Interagency Western Lynx Biology Team 2022).

Wildland Urban Interface from Community Wildfire Protection Plans near Northern Region Forests (Region 1 HFRA CWPP WUI) - Represents the WUI as described or mapped in Community Wildfire Protection Plans (CWPP). The rules and definition for CWPPs come directly from Part A of the WUI definition in HFRA, 2003. The CWPP data is developed by counties, or smaller government entities, therefore the Forest Service is not the authoritative source for these boundaries. CWPPs are created by local government entities through a collaborative process and are then approved by the State Forester. The CWPP WUI areas have been consolidated into the Forest Service system to facilitate legal and fiscal interpretations of WUI areas as specified in HFRA of 2003. Other community plans, like All Hazard Plans, that are developed by local government entities can also be used if they meet all the criteria for a CWPP. The data in this dataset comes either directly from counties or has been digitized from maps or written descriptions within the CWPP. Region 1 CWPP data provided on March 14, 2024 represent county CWPP data that have been verified to match CWPPs. This work is ongoing and Forests continue to validate CWPP WUI areas.

Beaverhead County Wildland-Urban Interface – data utilized as part of the 2021 Biological Assessment (USFS 2021) specific to Beaverhead County.

Timber Suitability on the Beaverhead-Deerlodge – coarse scale timber suitability classifications used for strategic planning. Actual location of timber suitability or harvest classifications may not be accurate. This data classifies timber into the follow categories: Elkhorns – Not Allocated in Plan; Not Suitable, No Harvest Allowed; Not Suitable, Timber Harvest Allowed; and Suitable for Timber Production.

US Forest Service Region 1 Whitebark Pine Potential Range – all lands within the USDA Forest Service Region 1 ownership that has the potential to support Whitebark Pine, given

the species ecological requirements and current topographic and climatic gradients. This product does not identify where whitebark pine currently exists on the landscape but rather models places that could support this species. The potential range estimation was created by combining several other datasets, including LANDFIRE 2.0 Biophysical Setting, Housman potential habitat/suitability, Whitebark pine existing in the 1990s from the Montana Natural Heritage Program, Keane 2000 Whitebark Pine Potential (Montana Natural Heritage Program and Karau modeling parameters), and Keane 2012 Potential Whitebark Pine Distribution. A white paper describes this workflow: Karau, Eva, Diana Tomback, Robert Keane and Julee Shamhart. 221. Whitebark Pine R1 Core Area Nomination Workflow Procedure. Unpublished report to the USDA Forest Service. National Whitebark Pine Restoration Plan R1/R4 Core Area Nomination Working Group. Version 2.12.21. pp22.

Recreation Sites for Region 1 - point data that consists of campgrounds, campsites, trailheads, picnic areas, roadside parks, and winter recreation areas.

Administrative Sites for Region 1 – point data that consists of existing buildings, structures, or resource activities.

Methodology

Methods for this analysis were written and developed by Patrick Warner, GIS Specialist on the Beaverhead-Deerlodge National Forest.

The main purpose of the data analysis was to create a single shapefile for granular acreage analysis incorporating all the above listed data sources. Multiple geoprocessing steps were used to make an analysis layer for WLBT tiers, Olson et al. 2021 habitat types (high and moderate), Lynx 2020 structural habitat, and exemptions and exceptions. The final purpose of these layers is to provide accurate and reliable lynx habitat acreage numbers with different queries. All data was processed and analyzed in ArcGIS pro. All numbers are considered estimates for acreages with rounding errors and possible topology issues.

The first input analysis layer is for the Olsen Habitat GIS data which was developed as follows:

1. The original source data for the Olsen et Al. lynx habitat is raster data. To provide reliable analysis and acreage numbers, the first step is to convert the raster to a polygon shapefile using the Raster to Polygon geoprocessing tool. The polygons were not simplified to maintain the fidelity of the raster and the field used for habitat classification was the value field showing numerical habitat ratings.
2. The working data from the previous step was further simplified using the Dissolve tool. Using the value field, thousands of attributes were reduced to just three, reflecting the three habitat ratings of high, moderate and low with this tool.
3. A text field was added to the Olson working data to classify the numbered value field to clear text description to be updated after the data is combined with the other analysis GIS data. This field is called "HabitatType"
4. The Intersect tool using the Olson working data, a layer with LAU and non-LAU areas in Southwest Montana with an on- and off-forest layer. All three layers generally cover the Beaverhead-Deerlodge NF and Southwest Montana. Combining them using the Intersect

tool provides critical information for habitat locations on or off forest and within or outside LAUs.

5. The Project tool was used to change the layer's coordinate system of North American Datum 1983 (NAD 83) to the forest standard projected coordinate system of North American Datum 1983 Universal Trans Mercator Zone 12 North or NAD83 UTM Zone 12N.
6. Using Calculate Field, the HabitatType field was calculated with low, moderate and high values based on the original raster gridcode value field with 1 = low, 2 = moderate, and 3 = high. This arcade prompt was used to populate the HabitatType field:

```
if ($feature.gridcode== 2) {  
    return "Moderate";  
}  
if ($feature.gridcode== 3) {  
    return "High";  
}  
if ($feature.gridcode== 1) {  
    return "low";  
}
```

7. The FID fields created from the previous Intersect function in step 4 were deleted for simplification.
8. Using the newly populated HabitatType field from step 6, attributes only classified as high or moderate were exported out into a new shapefile. This analysis does not include low habitat.
9. Finally, a Multipart to Single Part tool was used for the working output of this layer.

To create layers that determine the locations of Lynx habitat on and off forest; within exceptions and exemptions; and outside and inside LAUs, the following geoprocessing steps were executed:

1. An LAU and Non-LAU layer was created using the Union tool, combining the 2020 LAUs and the map forest buffer made previously in the beginning of the Lynx amendment process. Under the LAU_ID attribute field, the non-LAU area was labeled as "No LAU". This layer was also utilized for the Olsen et al. Habitat layer.
2. Forest and non-Forest ownership was also the result of Union tool geoprocessing. Beforehand, the ALP Forest boundary was separated into Areas based on the analysis focus. Using the Multipart to Single Part tool and making an "Area" text field, the forest was separated into Forest, Elkhorns, and the Lima-Tendoy. The latter two areas were classified specifically to be excluded from the analysis. The layer was further dissolved and combined with private, state and other federal agency ownership generalized into "Non-Forest".
3. Exceptions and Exemptions follows a more elaborate geoprocessing method than the previous two layers:
 - a. Beginning with the Recreation and Administrative sites, each layer was selected within the analysis area using the Select Layer by Location tool with the

LAU/Non-LAU layer as the selection layer. Using the selection, a 200 ft buffer was created around each site and designated as exceptions. The R1 White Bark Pine (WGP) Potential layer was also included in the exceptions and was selected by location using the LAU/Non-LAU layer.

- b. The Wildland Urban Interface (WUI) Exceptions is a combination of the previous Community Wildfire Protection Plan (CWPP) GIS data from the 2020 Lynx map update—specifically for Beaverhead County—and the current Region 1 CWPP WUI GIS data for Granite, Madison, Butte-Silverbow, Jefferson, Deer Lodge and Powell Counties. This current regional layer includes various county CWPP GIS data from all Montana Counties in Region 1 including buffers for evacuation routes, At Risk Communities, and Healthy Forests Restoration Act (HFRA) designated areas. It does not contain the current Beaverhead County CWPP WUI layer as the county does not have updated GIS WUI data. Previous CWPP data for the 2020 Lynx map update used the older CWPP data for Beaverhead County. It is incorporated into this working layer to reflect the previous data analysis for the 2020 Lynx modeled habitat used in this Addendum. Each WUI layer was selected by location using SQL queries with counties that the BDNF is in. The selections were combined using the Union tool and clipped by the forest boundary. The layer was further dissolved by the county field and given a WUI field with the value “FS WUI”. This data is the exemptions part of the working output layer.
- c. Finally, the WUI exemptions layer, the exception layers (Site buffers and WBP potential) and the timber plan suitability layer—which is an exception—were combined using the Union tool as the final layer displaying exemptions and exceptions. A text field was added called “ExemptExcept” with values showing attributes as “Exemption” or “Exception”. This addition was calculated using the WUI field where all WUI is labeled “Exemption” while all non-WUI attributes are labeled “Exceptions”.

The final section of this data creation combines the Habitat layers, exemptions/exceptions layer, generalized ownership and LAUs. The result is a shapefile and table for habitat acreage analysis.

1. For locational data, the forest ownership/non-ownership layer, Exemptions/Exceptions layer, and LAU/Non-LAU layers were all combined using the Union tool.
2. The 2020 Lynx Structural Habitat layer from the 2020 model data was consolidated using the Dissolve tool by the LAU_NAME and STRUCTURE Fields.
3. The latter layers and the WLBT Lynx Tier Layer were all combined using the Union tool again with another double field added for Analysis acreage and was calculated using area, international acres and the NAD 83 UTM zone 12 N projection.
4. A text field called “Edgematch” was added to the output for determining edge match conflicts and generalize attributes for symbology and analysis.

5. Within the working data, FID fields and other non-relevant fields such as multiple shape area length fields, creator/editor fields, and notes fields were removed using the Delete Field tool.
6. A final dissolve was done on the working output based on the following fields: STRUCTURE (Lynx Structural Habitat), HabitatType (Olson ratings), Tier (WLBT Tiers), LAU_ID, FOREST NAME, Area, Analysis Acres, ExemptExcept, WBP_Status, and Suitable. A selection using the area field specifically for 'Forest' and 'Non-Forest' was done to further filter any non-relevant data.
7. A field calculation was done on five fields to fill Null or blank attributes: Tier, STRUCTURE, HabitatType, LAU_ID, and ExemptExcept. The listed fields were calculated using the following arcade prompt with the same syntax. For example, the ExemptExcept field was calculated as follows:

```
If (IsEmpty($feature.ExemptExcept)){  
    return "Neither"  
}  
Else {  
    return $feature.ExemptExcept  
}
```

8. In the edgematch field, the following values were used: Lynx, Inholdings, Lynx Hab on BD Outside LAUs, No Lynx Hab Off Forest, No Lynx Hab On Forest, No Lynx Hab Within LAU Off Forest, No Lynx Hab Within LAU On Forest, Off Forest Admin Site, Off Forest Tiers, R1 LAUs Edgematch, and R4 LAUs Edgematch. These values were all entered using Select by Attribute and Location based on habitat and location fields while calculating multiple text attributes using Calculate Field. Polygons classified as "R1 LAU Edgematch" and "R4 LAU Edgematch" were excluded from the data calculations where habitat polygons fall outside of LAUs.
9. A spatial join with a "closest geodesic" match option was used to assign Olson and WLBT polygons outside of LAUs to the nearest LAU.
10. A final recalculation on the AnalysisAcres field was done using Area planar, international acres, and the NAD 1983 UTM zone 12N projection. The attribute table was exported out to an excel file using the Table to Excel tool. Within the Excel sheet, pivot tables using the attribute data as a source were utilized to create acreage summaries.
11. Data was reviewed and corrected as errors were discovered.

Lynx Habitat Excluded from Calculations

As described in the methodology, acres from both the Olson et al. 2021 and the management tier models overlap with the BDNF boundary in places where adjacent forests (Bitterroot, Salmon-Challis, and Lolo) have LAUs. These areas were excluded from "outside of LAU" calculations because those areas are caused by edge-mapping issues where polygon edges do not "line up" exactly (Figure 1).

In total, the Olson et al. 2021 model has 136 acres of high and 42 acres of moderate habitat that we did not include due to this overlap (Table 2). In addition, 1,127 acres of fragmented habitat patches within the Lima-Tendoy outside of LAUs were not included. Table 10 describes the number of patches and the associated LAU for these excluded acres. Patch size range from less than 1 acre to 72.3 acres, with the largest at the western edge of URC-01 that borders the Lolo National Forest.

Table 10. LAUs on the Beaverhead-Deerlodge National Forest with relative probability habitat modeled by Olson et al. 2021 that occur adjacent to a neighboring forest's LAUs.

District	LAU with Olson et al. 2021 Habitat Probability Outside of Boundary	Olson et al. 2021 Habitat Probability	Adjacent Forest and LAU name	Area Total (acres)
Wisdom	BH-07	moderate	BTNF: East Fork	0.1
Wisdom	BH-08	moderate	BTNF: East Fork	1.2
Wisdom	BH-09	high/moderate	BTNF: East Fork and Meadow-Tolan	High: 0.1 acres Moderate: 7.7 acres
Wisdom	BH-10	high/moderate	BTNF: Meadow-Tolan	High: <1 Moderate: 3.2
Wisdom	BH-11	high/moderate	BTNF: Meadow-Tolan and Camp Creek SCNF: North Fork Headwaters	High: 7.1 Moderate: 6.6
Wisdom	BH-12	high/moderate	SCNF: North Fork Headwaters	High: 5.3 Moderate: 1.2
Wisdom	BH-13	moderate	SCNF: Sheep Mountain	High: 2.7 Moderate: 3.1
Wisdom	BH-14	Moderate	SCNF: Sheep Mountain	1.6
Wisdom	BH-15	Moderate	SCNF: Sheep Mountain	2.4
Pintler	URC-01	High/moderate	LNF: Eightmile, Ranch, and Rock Face	High: 104.3 Moderate: 16.8
Pintler	URC-02	High/moderate	LNF: Wyman; BTNF: Burnt Fork and Daly Creek	High: 6.6 Moderate: 4.3
Pintler	URC-03	High/moderate	BTNF: Daly Creek	High: 0.5 Moderate: 0.1
Pintler	URC-04	High/moderate	BTNF: Daly Creek and Skalkaho Creek	High: <1 Moderate: 5.5
Pintler	URC-05	High/moderate	BTNF: Skalkaho Creek, Divide-Sleeping Child, and Martin-Moose	High: 8.5 Moderate: 2.7
Pintler	URC-06	High/moderate	BTNF: Martin-Moose	High: 0.3 Moderate: 1.8
Pintler	URC-08	High/moderate	BTNF: Martin-Moose and East Fork	High: 0.2 Moderate: 25.0
Pintler	URC-09	Moderate	BTNF: East Fork	<1

The Western Lynx Biology Team Framework also had some edge-mapping errors when LAU and administrative boundary polygons were clipped to the management tiers. We did not include 190 acres within management Tier 2 (Table 6) as these polygons are adjacent to another Forest's LAUs (Table 11). Patch size for the excluded acres range from less than 1 acre to 72.3 acres, with the largest at the western edge of URC-01 that borders the Lolo National Forest (this is the same as the Olson et al. area).

Table 11. LAUs on the Beaverhead-Deerlodge National Forest with management tier polygons modeled by the Western Lynx Biology Team Spatial Framework that occur adjacent to a neighboring forest's LAUs.

District	LAU with WLBT Spatial Framework Tier Outside of Boundary	WLBT Management Tier Type	Adjacent Forest and LAU name	Area Total (acres)
Wisdom	BH-09	2	BTNF: East Fork and Meadow-Tolan	10.8
Wisdom	BH-10	2	BTNF: Meadow-Tolan	1.5
Wisdom	BH-11	2	BTNF: Meadow-Tolan and Camp Creek SCNF: North Fork Headwaters	13.4
Wisdom	BH-12	2	SCNF: North Fork Headwaters	6.5
Wisdom	BH-13	2	SCNF: Sheep Mountain	4.8
Wisdom	BH-15	2	SCNF: Sheep Mountain	<1
Pintler	URC-01	2	LNF: Ranch and Rock Face	111.8
Pintler	URC-02	2	LNF: Wyman; BTNF: Burnt Fork and Daly Creek	10.9
Pintler	URC-03	2	BTNF: Daly Creek	0.6
Pintler	URC-04	2	BTNF: Daly Creek and Skalkaho Creek	5.8
Pintler	URC-05	2	BTNF: Skalkaho Creek, Divide-Sleeping Child, and Martin-Moose	11.2
Pintler	URC-06	2	BTNF: Martin-Moose	2.2
Pintler	URC-08	2	BTNF: Martin-Moose and East Fork	10.6

Appendix B. Figure and Map Package

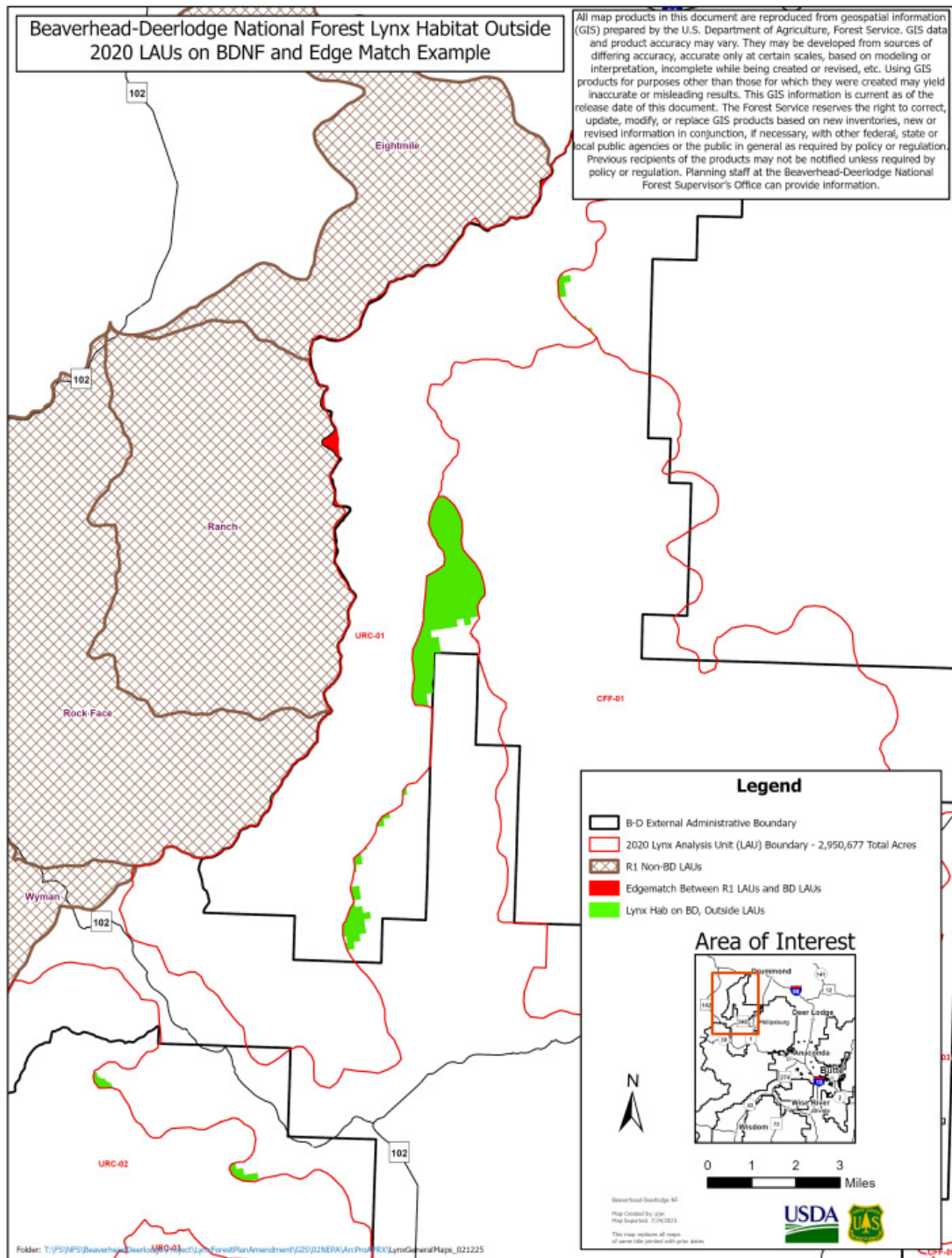


Figure 1. Edge-matching issues when comparing Olson et al. 2021 and the Western Lynx Biology Team Spatial Framework to 2020 Lynx Analysis Units and lynx habitat on the Beaverhead-Deerlodge National Forest. Areas in red were not included as part of “habitat on the Forest” because they overlapped with a Lynx Analysis Unit on an adjacent forest. Areas in green are included because they are outside of Lynx Analysis Units on the Beaverhead-Deerlodge, but are still within the administrative boundary.

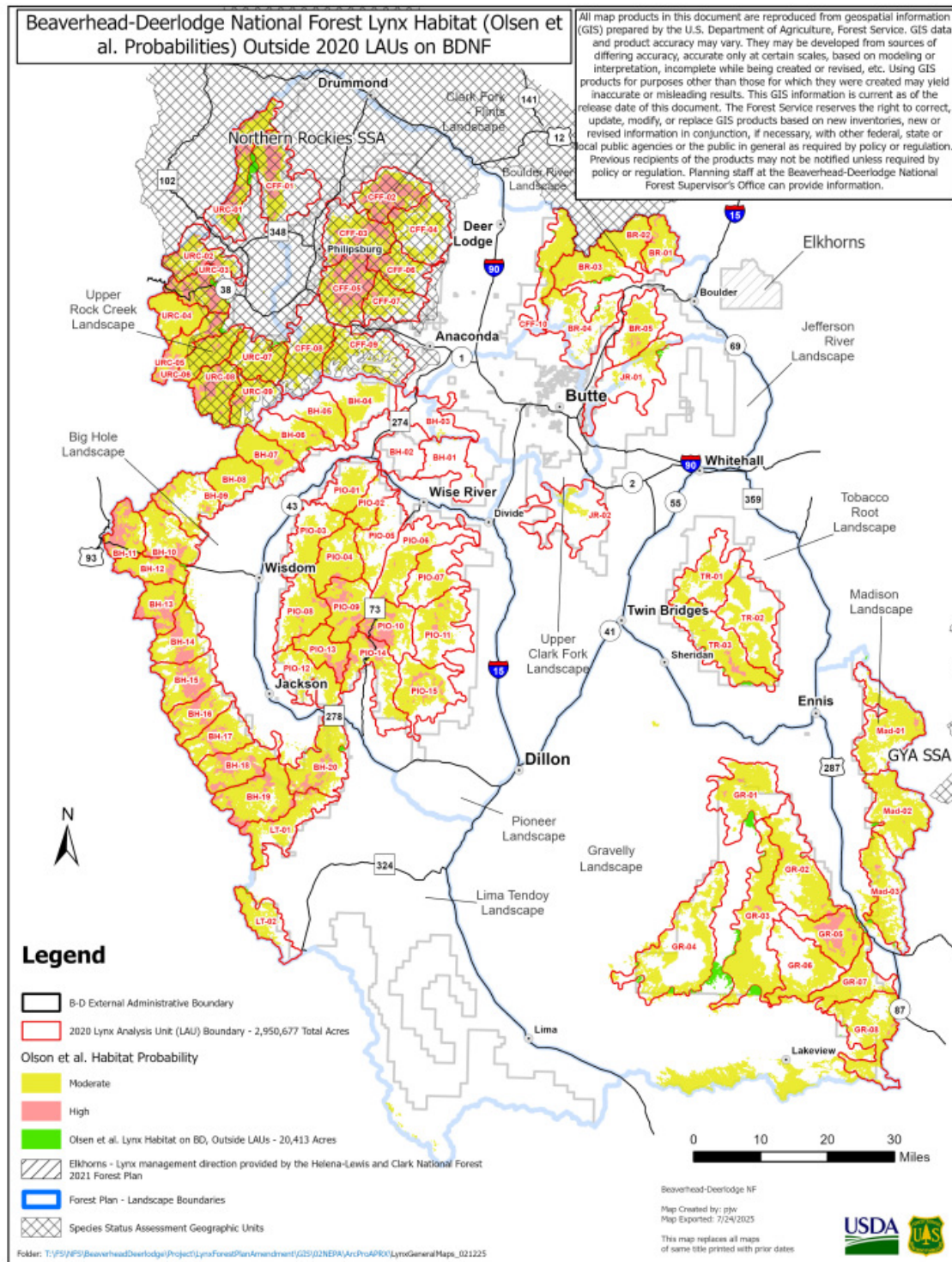


Figure 2. Olson et al. 2021 habitat probability overlap with lynx analysis units on the Beaverhead-Deerlodge National Forest.

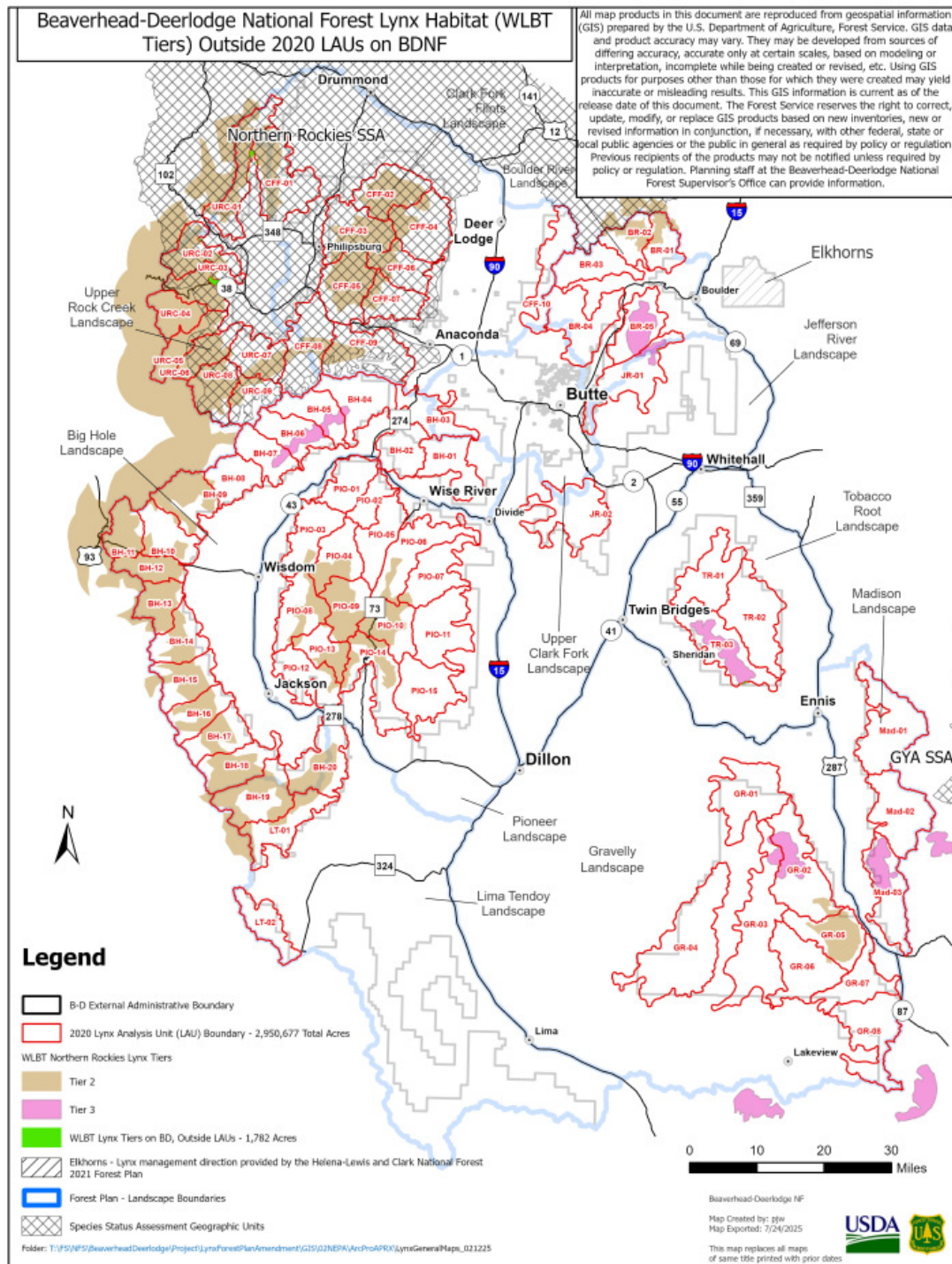


Figure 3. Western Lynx Biology Team Spatial Framework tiers overlap with lynx analysis units on the Beaverhead-Deerlodge National Forest.