

MEMORANDUM | May 1, 2014

TO U.S. Fish and Wildlife Service (Service)
FROM Industrial Economics, Incorporated (IEc)
SUBJECT Screening Analysis of the Likely Economic Impacts of Critical Habitat Designation for Graham's and White River Beardtongues

On August 6, 2013, the Service published a proposed rule to designate critical habitat for Graham's beardtongue (*Penstemon grahamii*) and White River beardtongue (*Penstemon scariosus* var. *albifluvis*) under the Endangered Species Act (the Act).¹ As part of the rulemaking process, the Service must consider the economic impacts, including costs and benefits, of the proposed rule in the context of two primary requirements:²

- **Executive Order (EO)12866 *Regulatory Planning and Review***, which directs Agencies to assess the costs and benefits of regulatory actions and quantify those costs and benefits if an action may have an effect on the economy of \$100 million or more in any one year; and
- **Section 4(b)(2) of the Act**, which requires the Secretary of the Interior to consider economic impacts prior to designating critical habitat.³

This memorandum provides information to the Service on the potential for the proposed critical habitat rule to result in costs exceeding \$100 million in a single year. If costs do not exceed this threshold, EO 12866 suggests that a qualitative assessment may be sufficient. This memorandum also identifies the geographic areas or specific activities that could experience the greatest impacts, measured in terms of changes in social welfare, to inform the Secretary's decision under section 4(b)(2).⁴

To prepare this assessment, we rely on: (1) the proposed rule and associated geographic information systems (GIS) data layers provided by the Service; (2) the Service's Incremental Effects Memorandum (described in greater detail later in this

1 Proposed Critical Habitat Rule, 78 FR 47832.

2 Additional laws and executive orders require the consideration of the distribution of impacts on vulnerable subpopulations, such as small entities and state or local governments. These requirements for distributional analysis are beyond the scope of this memorandum.

3 Clinton (1993). As affirmed in Obama (2011).

4 The discipline of welfare economics focuses on maximizing societal well-being (Just et al., 2004). It measures costs and benefits in terms of the opportunity costs of employing resources for the conservation of the species and individual willingness to pay to conserve those species. Opportunity cost is the value of the benefit that could have been provided by devoting the resources to their best alternative uses. Opportunity costs differ from the measurement of accounting costs (e.g., actual expenses). Welfare economics is recognized by the U.S. Office of Management and Budget (OMB) as the appropriate tool for valuing the costs and benefits of proposed regulatory actions (U.S. Office of Management and Budget, 2003).

memorandum); (3) public comments; (4) interviews with relevant stakeholders; and (5) other relevant studies and reports prepared by Federal and state agencies.

FINDINGS OF THE SCREENING ANALYSIS

Critical habitat designation for the beardtongues is unlikely to generate costs exceeding \$100 million in a single year. Data limitations prevent the quantification of benefits.

Section 7 Costs

This analysis estimates section 7 costs likely to result from the proposed critical habitat designation for the beardtongues. The analysis forecasts the total number of future consultations likely to occur for oil and gas development (traditional and unconventional) and grazing activities undertaken by or permitted by Federal agencies within proposed critical habitat. In addition, the analysis forecasts costs associated with conservation efforts that may be recommended in consultation for oil and gas activities occurring in incremental pollinator habitat. The total quantifiable incremental section 7 costs associated with the proposed designation are estimated to be approximately \$2,900,000 (2013 dollars) in a single year.

Other Costs

This analysis concludes that the designation of critical habitat is unlikely to trigger additional requirements under state or local regulations based on conversations with agency representatives in Colorado and Utah. In addition, we consider the possibility that the value of private grazing lands could be negatively affected due to public perception of the consequences of critical habitat designation. Such impacts, if they occur, are unlikely to reach \$100 million in a given year when combined with costs quantified above.

Benefits

The magnitude of benefits is also highly uncertain, and quantification would require primary research and the generation of substantial amounts of new data, which is beyond the scope of this memorandum and Executive Order 12866.

Geographic Distribution of Impacts

Exhibit 7, presented later in this report, provides estimates of the likely incremental costs associated with oil and gas activity in each unit (grazing impacts are relatively small by comparison). Given available data and our modeling assumptions, impacts are likely to be relatively larger in Graham's beardtongue Units 1 through 4, which have more acres where incremental effects could occur. We identified three imminent oil shale projects; one with a Federal nexus is located in Graham's beardtongue Unit 3 and White River Beardtongue Unit 1.

SECTION 1. BACKGROUND

Graham's and White River beardtongues (hereafter, beardtongues) are local endemic plants associated with oil shale barrens in Uinta and Duchesne Counties, UT, and Rio Blanco County, CO.⁵ Most populations are associated with the oil shale-rich Mahogany ledge.⁶ According to the Service's Incremental Effects Memorandum, "Graham's beardtongue occurs along a horseshoe-shaped band about 80 miles long

⁵ U.S. Fish and Wildlife Service (2014).

⁶ Proposed Critical Habitat Rule, 78 FR 47832.

and 6 miles wide extending from the extreme southeastern edge of Duchesne County in Utah to the northwestern edge of Rio Blanco County in Colorado. White River beardtongue's range extends from the vicinity of Willow Creek in Uintah County, Utah, to Raven Ridge west of Rangely in Rio Blanco County, Colorado.”⁷

The Service proposes to designate approximately 27,502 hectares (67,958 acres) across five units as Graham's beardtongue critical habitat and 6,036 hectares (14,913 acres) across three units as White River beardtongue critical habitat.⁸ Approximately 54 percent of White River beardtongue proposed critical habitat, or 8,053 acres, overlaps Graham's beardtongue proposed critical habitat. All of the units are occupied, as the Service created the boundaries of proposed critical habitat based on existing known plant populations. Around each known population, the Service included area to support the plants' pollinator species. Specifically, for Graham's beardtongue, the Service included all pollinator habitat within 700 meters (2,297 feet). For White River beardtongue, the Service included all pollinator habitat within 500 meters (1,640 feet).⁹

Approximately 66 percent of the proposed designation for Graham's beardtongue is located on BLM lands, approximately 18 percent is located on private lands, and approximately 16 percent is located on state lands. Approximately 39 percent of the proposed designation for White River beardtongue is located on BLM lands, approximately 47 percent is located on private lands, and approximately 14 percent is located on state lands. The designation does not include any Tribal lands. Exhibit 1 summarizes the proposed critical habitat acres by unit and land owner. Exhibit 2 provides an overview map of the proposed designation.

⁷ U.S. Fish and Wildlife Service (2014).

⁸ Proposed Critical Habitat Rule, 78 FR 47832.

⁹ Personal communication with the Service on January 14, 2014.

EXHIBIT 1. SUMMARY OF PROPOSED CRITICAL HABITAT UNITS

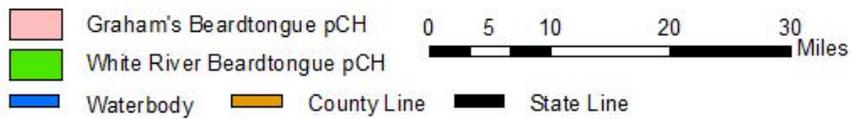
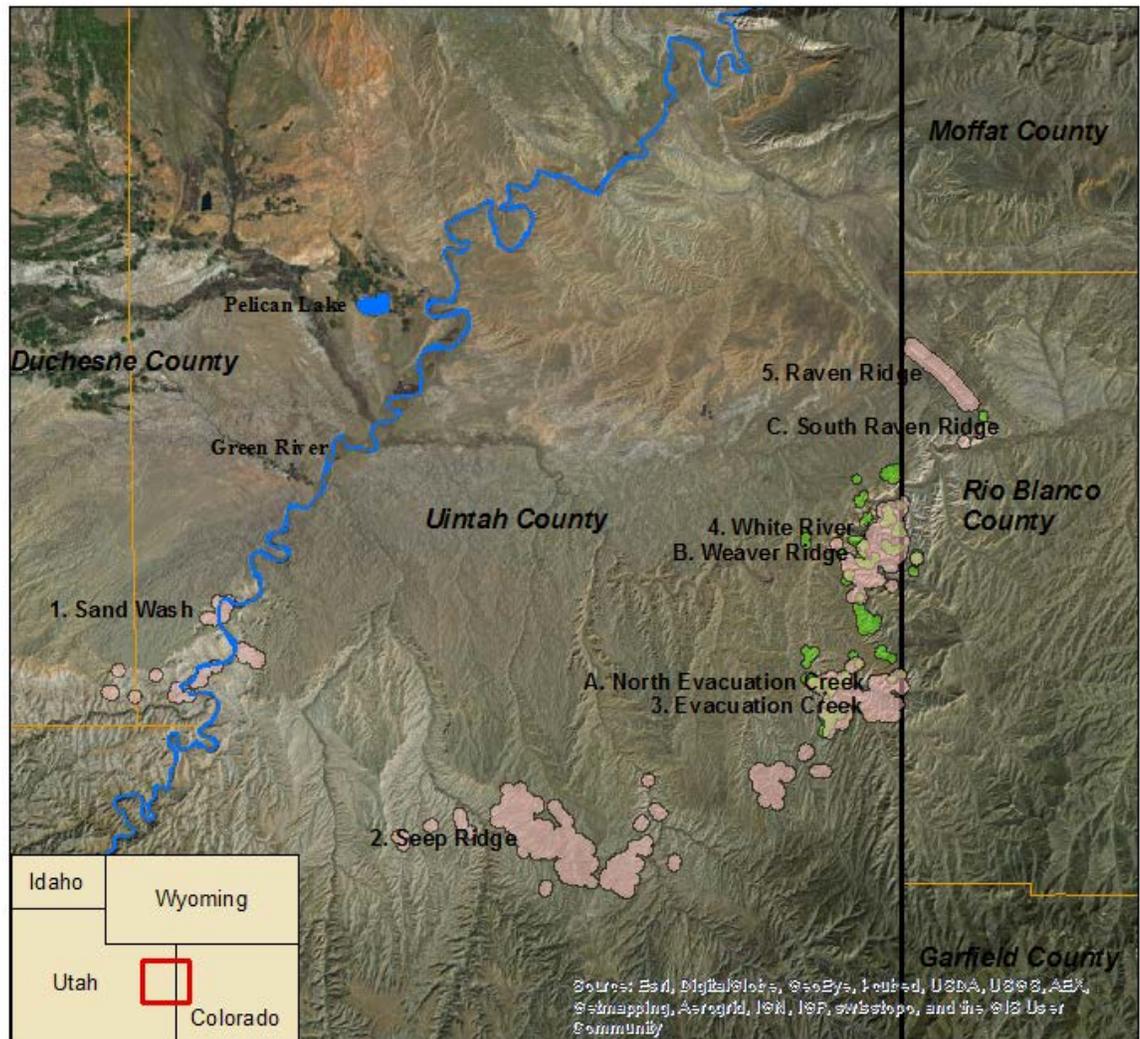
SPECIES	UNIT	NAME	LAND OWNERSHIP (ACRES)			
			FEDERAL	STATE	PRIVATE	TOTAL
Graham's beardtongue	1	Sand Wash	7,550	66	189	7,805
	2	Seep Ridge	16,430	6,549	2,131	25,110
	3	Evacuation Creek	9,586	3,502	4,033	17,121
	4	White River	5,542	991	5,059	11,592
	5	Raven Ridge	5,578	-	752	6,330
	Subtotal			44,686	11,108	12,164
White River beardtongue	1	North Evacuation Ridge	3,382	457	3,495	7,334
	2	Weaver Ridge	1,946	1,608	3,452	7,006
	3	South Raven Ridge	472	-	101	573
	Subtotal			5,800	2,065	7,048
Total			46,157	12,551	15,098	73,817 ¹

Source: Proposed Critical Habitat Rule, 78 FR 47832.

Notes:

1. Area subtotals do not sum to total area due to geographic overlap between the two species' proposed critical habitat units. Approximately 54 percent of White River beardtongue proposed critical habitat overlaps Graham's beardtongue proposed critical habitat.
2. Area subtotals may not sum due to rounding.

EXHIBIT 2. OVERVIEW OF PROPOSED CRITICAL HABITAT



Note: unit names with numbers refer to Graham's pCH, while unit names with letters refer to White River pCH.

Sources:

1. US Fish and Wildlife Service, Utah Field Office
2. Environmental Systems Research Institute (ESRI), Redlands, California, USA

Because the beardtongues are not yet listed under the Act, no consultations have been conducted for the species.¹⁰ However, based on information provided in the proposed rule, the Service’s incremental effects memorandum, and follow-up communication with the Service, we identified oil and gas development and grazing as the primary activities occurring within the areas proposed for designation that may experience impacts from the rule.^{11,12,13}

SECTION 2. FRAMEWORK

Guidelines issued by the U.S. Office of Management and Budget (OMB) for the economic analysis of regulations direct Federal agencies to measure the costs and benefits of a regulatory action against a baseline (i.e., costs and benefits that are “incremental” to the baseline). OMB defines the baseline as the “best assessment of the way the world would look absent the proposed action.”¹⁴ In other words, the baseline includes any existing regulatory and socio-economic burden imposed on landowners, managers, or other resource users absent the designation of critical habitat. The baseline includes the economic impacts of listing the species under the Act, even if the listing occurs concurrently with critical habitat designation. Impacts that are incremental to the baseline (i.e., occurring over and above existing constraints) are those that are solely attributable to the designation of critical habitat. This screening analysis focuses on the likely incremental effects of the critical habitat designation.

We consider incremental effects of the designation in two key categories: 1) those that may be generated by section 7 of the Act; and 2) other types of impacts outside of the context of section 7:

- **Incremental section 7 impacts:** Activities with a Federal nexus that may affect listed species are subject to section 7 consultation to consider whether actions may jeopardize the existence of the species, even absent critical habitat.¹⁵ As part of these consultations, critical habitat triggers an additional analysis evaluating whether an action will diminish the recovery potential or conservation value of the designated area. Specifically, following the designation of critical habitat, Federal agencies must also consider the potential for activities to result in the destruction or adverse modification of critical habitat. These consultations are the regulatory mechanism through which critical habitat rules are implemented. Any time and effort spent on this additional analysis, as well as the costs and benefits of implementing any recommendations resulting from this review, are economic impacts of the critical habitat designation.

¹⁰ As described later in this memorandum, although no consultations have been initiated, the U.S. Bureau of Land Management conferences with the Service on these species due to their current candidate status.

¹¹ Proposed Critical Habitat Rule, 78 FR 47832.

¹² U.S. Fish and Wildlife Service (2014).

¹³ Personal communication with the U.S. Fish and Wildlife Service, December 19, 2013.

¹⁴ OMB (2003). Circular A-4 provides “guidance to Federal Agencies on the development of regulatory analysis as required under Section 6(a)(3)(c) of Executive Order 12866...” (p. 1)

¹⁵ A Federal nexus exists for activities authorized, funded, or carried out by a Federal agency.

- **Other incremental impacts:** Critical habitat may also trigger additional regulatory changes. For example, the designation may cause other Federal, state, or local permitting or regulatory agencies to expand or change standards or requirements. Regulatory uncertainty generated by critical habitat may also have impacts. For example, landowners or buyers may perceive that the rule will restrict land or water use activities in some way and therefore value the resource less than they would have absent critical habitat. This is a perceptual, or stigma, effect of critical habitat on markets.

SECTION 3. SECTION 7 COSTS OF THE CRITICAL HABITAT RULE

In this section, we discuss the likelihood that the designation of critical habitat will result in incremental costs through the section 7 consultation process. For each activity, we discuss the likelihood that it will occur in the reasonably foreseeable future, identify whether the projects will have a Federal nexus, and identify likely future administrative and project modification costs. Each activity is discussed separately, including: (1) traditional oil and gas development; (2) oil shale and tar sands development; and (3) grazing.

TRADITIONAL OIL AND GAS

This section presents our analysis of the likely impacts of the proposed designation on traditional oil and gas activities. We focus on oil and gas activities on Federal lands and on private lands with Federal subsurface mineral rights, as oil and gas activities on state- or privately-owned land typically lack a Federal nexus for section 7 consultation outside of the presence of Federal subsurface mineral rights. The U.S. Bureau of Land Management (BLM) manages large amounts of land in every proposed critical habitat unit and auctions Federal oil and gas leases in these areas annually.

To assess the potential future impacts to the oil and gas industry, this analysis proceeds through the following steps:

1. First, we consider how critical habitat designation will affect oil and gas activities on a site-specific basis.
2. Next, we estimate costs of compliance on a per-well pad basis.
3. Then, we estimate the amount of future oil and gas development activity (i.e., construction of well pads) that may reasonably occur within proposed critical habitat in a given year.
4. Finally, we estimate total costs of anticipated future conservation efforts for each critical habitat unit.

Effects of Critical Habitat Designation on Specific Projects

We begin by identifying where incremental impacts to oil and gas projects are likely to occur within the proposed designation. The Service developed the boundaries of proposed critical habitat based on the location of known populations of the species. In order to protect the beardtongues' pollinator species, the Service drew a 500 meter "pollinator buffer" around each known occurrence of White River beardtongue and a 700 meter pollinator buffer around each known occurrence of Graham's beardtongue to

create the boundaries of proposed critical habitat. Absent critical habitat, the Service would not require formal consultation or conservation measures inside the pollinator buffers, unless the project occurred within areas the Service calls “consultation buffers.” In Utah, the formal consultation buffer for the beardtongues is 300 feet (91 meters) from known plant locations, although informal consultation can take place within suitable habitat.¹⁶ In Colorado, the formal consultation buffer is 100 meters from known plant locations, and the informal consultation buffer extends up to 300 meters.¹⁷

Absent critical habitat, action agencies are likely to initiate consultation with the Service on projects within the consultation buffers due to the presence of the species. Furthermore, within these areas, the Service is unlikely to recommend project modifications to avoid adverse modification of critical habitat that are different from those required to avoid jeopardizing the species.¹⁸ Therefore, for projects located within the consultation buffers, incremental costs are limited to the minor additional administrative effort needed to address critical habitat in the consultation documents.

If a project falls outside of the consultation buffer, action agencies may initiate informal consultations absent critical habitat, but the Service is unlikely to require formal consultation or project modifications. With the designation of critical habitat, the Service will require formal consultation and may request project modifications on all consultations for projects within the pollinator buffer. These costs are an incremental effect of the designation. Exhibit 3 summarizes the consultation buffer and the pollinator buffer (i.e., the extent of proposed critical habitat) for Graham’s beardtongue and White River beardtongue in Colorado and Utah.

EXHIBIT 3. CONSULTATION BUFFER AND POLLINATOR BUFFER BY SPECIES IN COLORADO AND UTAH: TRADITIONAL OIL AND GAS DEVELOPMENT

	COLORADO		UTAH	
BUFFER TYPE	GRAHAM’S	WHITE RIVER	GRAHAM’S	WHITE RIVER
Formal Consultation	100 meters*	100 meters*	91 meters	91 meters
Pollinator	700 meters	500 meters	700 meters	500 meters

Source: U.S. Fish and Wildlife Service (2014).
Note: In Colorado, informal consultations may occur in the baseline more than 100 meters and up to 300 meters from the plant.

¹⁶ For oil and gas projects located within 300 feet of a known plant location, BLM’s Vernal Field Office in Utah will consult with the Service, regardless of whether critical habitat is present. (Personal communication with the Service on December 19, 2013.)

¹⁷ In contrast to Utah, BLM’s White River Field Office currently conferences on projects in a larger area around known plant locations. (Personal communication with the Service on December 19, 2013; and personal communication with the Service on April 25, 2014.)

¹⁸ The Service writes, “we anticipate that section 7 consultation analyses will result in no differences between recommendations to avoid jeopardy to species or adversely modify critical habitat within all critical habitat units.” (U.S. Fish and Wildlife Service, 2014); personal communication with the U.S. Fish and Wildlife Service on December 19, 2013.

As described above, traditional oil and gas projects on state or private lands lacking Federal subsurface mineral rights are unlikely to have a Federal nexus. Therefore, such projects are unlikely to experience section 7 impacts. Additionally, costs resulting from consultations on projects located within the Service’s consultation buffers are primarily baseline impacts of the designation. Therefore, we only quantify impacts to oil and gas activities in areas with Federal mineral rights in the incremental portion of pollinator habitat located outside the consultation buffer. Exhibit 4 presents the total acreage of these areas.

EXHIBIT 4. AREAS WITH FEDERAL MINERAL RIGHTS IN INCREMENTAL POLLINATOR HABITAT (ACRES)

COLORADO*	UTAH	TOTAL
2,595	36,047	38,642
<p>Source: Personal communication with the Service on December 19, 2013; Personal communication with Jefferson Kyle Smith, GIS Specialist, BLM Vernal Field Office on February 7, 2014; Utah Automatic Geographic Reference Center (2014); Personal communication with Eric Allen, GIS Specialist, BLM White River Field Office, on January 28, 2014.</p> <p>Note: The acres presented for Colorado exclude the acres within the incremental pollinator buffer that overlap BLM’s Areas of Critical Environmental Concern (ACECs). In addition, we exclude areas more than 100 meters but less than 300 meters from the plants because informal consultations would occur in these areas absent the designation.</p>		

Per-Well Pad Costs of Compliance

The Service may recommend conservation efforts related to oil and gas activities in incremental pollinator habitat, including the following:^{19,20}

- Minimization of surface disturbance;
- Modification of project design to avoid areas that are especially important to the species; and
- Incorporating Best Management Practices (BMPs) for habitat protection, such as dust control, weed control, and the use of native species in re-vegetation.

Exhibit 5 summarizes potential recommendations that may be requested by the Service during section 7 consultations on oil and gas development activities and their estimated per project cost. We estimate per-well pad costs of compliance for such measures using information provided by a private oil and gas corporation called OXY USA (OXY). This cost information was developed for the 2012 economic analysis of the designation of critical habitat for three plants in western Colorado, including Parachute

¹⁹ More rigorous conservation measures may be recommended within the baseline conservation buffer. We do not quantify costs associated with such conservation measures because they are considered to be part of the baseline.

²⁰ U.S. Fish and Wildlife Service (2014); personal communication with the U.S. Fish and Wildlife Service on December 19, 2014; and personal communication with the Service on April 25, 2014.

beardtongue, and is based on the costs incurred by the company for an actual project located in critical habitat.²¹

Designated critical habitat for Parachute beardtongue is located in Mesa and Garfield Counties, Colorado, south of the currently proposed beardtongue critical habitat in Rio Blanco County, Colorado. We believe the cost estimates developed for the Parachute beardtongue analysis are applicable to this analysis because the species has similar conservation needs to Graham's and White River beardtongues and occurs in a similar geographic area. Based on information from the Service regarding its likely recommendations regarding conservation measures for the current proposed designation, we abridged OXY's original list of project modification costs (presented in Exhibit 5).²²

BLM and the Service estimate that in 75 percent of cases a well pad in incremental pollinator habitat could be moved, incurring the cost of conservation effort (1) shown below in Exhibit 5 (\$45,500). In the other 25 percent of cases, the well pad would remain in place, but would incur the sum of costs of conservation efforts (2) through (4) (\$450,000). The total cost per multi-well pad thus represents the average cost of these two scenarios, weighted by probability.²³

The costs included in Exhibit 5 were estimated by OXY for multi-well pads that could have up to 20 wells each and are based on the company's agreement with the Colorado Natural Areas Program (CNAP) regarding the Mount Callahan and Mount Callahan Saddle Natural Areas.²⁴ According to BLM, most well pads expected to occur near the proposed critical habitat will support eight to ten wells.²⁵ Therefore, the per-well pad cost estimates shown in Exhibit 5 may potentially overstate the cost of conservation measures for well pads within proposed critical habitat because the costs were developed with larger, more complex well pads in mind.

²¹ Industrial Economics, Incorporated (2012a).

²² Personal communication with U.S. Fish and Wildlife Service, February 28, 2014.

²³ Personal communication with U.S. Fish and Wildlife Service, March 19, 2014.

²⁴ Personal communication with Chris Clark, OXY USA WTP LP, December 22, 2011.

²⁵ U.S. Bureau of Land Management, White River Field Office. August 2012. "Draft Resource Management Plan Amendment and Environmental Impacts Statement for Oil and Gas Development."

EXHIBIT 5. POTENTIAL PER-WELL PAD INCREMENTAL COSTS (2013\$)

CONSERVATION EFFORT	PROBABILITY	COST ¹
(1) Design well pad and supporting infrastructure to avoid areas important to the species and their habitat - may require re-engineering placement of pad and infrastructure in less desirable locations	75 percent	\$45,500
(2) Control for noxious weeds, either by hand spraying or weeding by hand	25 percent	\$69,000
(3) Dust controls, including watering roads and using MgCl or a substitute	25 percent	\$351,000
(4) Re-vegetation - re-seeding to enhance current plant populations or populate unoccupied units	25 percent	\$30,000
Weighted Average Typical Cost Per Multi-Well Pad²		\$150,000
<p>Sources: (1) Personal communication with Chris Clark, OXY USA WTP LP, December 22, 2011; and Personal communication with OXY USA WTP LP, February 15, 2012, as referenced in Industrial Economics, Incorporated (2012a); and (2) Personal communication with U.S. Fish and Wildlife Service, March 19, 2014.</p> <p>Notes:</p> <p>1. 2012 estimates were converted to 2013 dollars using the Gross Domestic Product Implicit Price Deflator (BEA, 2014).</p> <p>2. Weighted average may not compute due to rounding.</p>		

Well Pad Forecasts

Next, we develop a forecast of future oil and gas activity in the areas proposed as critical habitat. To do this, we apply an annual rate of new well pad construction per acre to the acreage of incremental pollinator habitat with a Federal nexus (presented in Exhibit 4). We develop an annual rate of new well pad construction per acre using two forecasts of oil and gas activity in Utah and Colorado developed by BLM.

In Colorado, BLM’s White River Field Office developed the *Draft Resource Management Plan Amendment and Environmental Impact Statement for Oil and Gas Development* (White River EIS), which includes a forecast of oil and gas activity in the area from 2012 to 2032.²⁶ The White River EIS estimates that 1,800 well pads will be constructed within approximately 2.2 million acres managed by the White River Field Office between 2013 and 2032, for an average of 90 well pads per year.²⁷ Using this forecast, we develop a per-acre rate of annual well pad construction of approximately 0.00004 well pads per acre per year, assuming the pads are equally likely to be drilled in any location within the study area.

We then apply the per-acre annual rate of new well pad construction to the acreage of incremental pollinator critical habitat in Colorado where oil and gas impacts might occur, as presented in Exhibit 4. This 2,595 acre area encompasses all proposed critical habitat located on Federal lands, excluding BLM’s Areas of Critical Environmental Concern (ACECs), which are already subject to baseline protection. The 2,595 acre

²⁶ U.S. Bureau of Land Management. White River Field Office (2012).

²⁷ The White River Field Office manages all areas of proposed beartongues critical habitat in Colorado.

area also excludes private lands that do not have Federal mineral rights.^{28,29} This results in a forecast of approximately one-tenth of a well pad per year in pollinator habitat with a Federal nexus in Colorado.

To forecast future oil and gas activity in Utah, we use data from BLM's Vernal Field Office's *Greater Uinta Basin Oil and Gas Cumulative Impacts Technical Support Document*.³⁰ The document relies on two sources of information on pending oil and gas projects to estimate future activity. The study area spans 5,853,000 acres in Uinta, Duchesne, Baggett, Carbon, and Grand Counties, Utah. The Document forecasts the construction of 1,659 well pads over varying time periods between 2013 and 2016 based on pending Utah Department of Oil, Gas, and Mining (UDOGM) Applications for Permit to Drill (APDs).^{31,32,33} Additionally, based on pending BLM projects not included in the UDOGM estimate, the report forecasts the construction of 14,137 new well pads over 20 years.³⁴

Most of the future activity is likely to be located in areas north of the proposed designation due to geological constraints in the proposed critical habitat area.³⁵ However, as the exact locations of future wells is uncertain, we conservatively consider an area of 2,988,160 acres—essentially the area immediately surrounding the part of the county where oil and gas activities are expected to occur—in order to estimate a future rate of well pad construction. We estimate an annual average rate of 0.0005 well pads per acre, assuming the wells are equally likely to be drilled in any location within the Greater Uinta Basin.³⁶

As in Colorado, we apply the per-acre annual rate of new well pad construction to the total acres of incremental pollinator habitat in Utah. In Utah, these areas total 36,047 acres.³⁷ Using this methodology, we forecast approximately 17 new well pads annually

²⁸ The analysis assumes that consultations on projects inside Colorado's informal consultation buffer (more than 100 meters and up to 300 meters from the plant) will not result in incremental project modifications. If the Service would not have requested the above referenced project modifications in these areas absent critical habitat, our analysis may understate incremental costs. However, the degree of downward bias in the cost estimate is likely to be minimal. Assuming the same rate of forecasted well-pad projects per year in Colorado (about 0.00004 well pads per acre per year), an additional \$2,000 in costs associated with incremental project modifications is possible in these areas.

²⁹ This 2,595 acre area includes 150 acres of private lands that overlap Federal subsurface mineral rights.

³⁰ U.S. Bureau of Land Management. Vernal Field Office (2012).

³¹ U.S. Bureau of Land Management. Vernal Field Office (2012); personal communication with Stephanie Howard, U.S. Bureau of Land Management, Vernal Field Office, on February 18, 2014.

³² Under the authority of Utah State statutes regulating well density throughout the entire state, UDOGM initiates permitting for all oil and gas projects in the state of Utah, including those occurring on Federal lands. Therefore, the estimate of foreseeable well pads based on UDOGM APDs is takes into account future well pad construction in all areas proposed for critical habitat between 2013 and 2016.

³³ In order to calculate the likely number of well pads developed per acre per year within the study area, we apply the average (2.5 years) of UDOGM's forecast timeframe.

³⁴ U.S. Bureau of Land Management. Vernal Field Office (2012); personal communication with Stephanie Howard, U.S. Bureau of Land Management, Vernal Field Office, on February 18, 2014.

³⁵ Personal communication with staff at the U.S. Bureau of Land Management, February 18, 2014.

³⁶ Effectively, we calculate a higher density of wells based on the forecasts and areas of likely drilling activity and apply that rate to the broader basin. Based on our conversation with BLM, we believe this approach is conservative, in that it is more likely to overstate than understate the number of new well pads that would be proposed in incremental pollinator habitat.

³⁷ This 36,047 acre area includes less than three acres of private lands that overlap Federal subsurface mineral rights.

in Utah. This approach likely overstates future activity in incremental pollinator habitat.

Finally, we apply per-well pad conservation costs, as presented in Exhibit 5, to the annual well pad forecast. In addition to the costs of conservation measures, our analysis anticipates that each traditional oil and gas project in incremental pollinator habitat will undergo a formal consultation with the Service. Our analysis includes the additional administrative costs of considering critical habitat as part of these consultations.³⁸ Per consultation administrative costs are estimated based on information collected previously from consultation records and discussions with multiple Service field offices. Exhibit 6 presents the average costs of consultation used in this analysis. Exhibit 7 presents the annual incremental costs associated with oil and gas activities within the incremental pollinator habitat. Total annual incremental costs associated with oil and gas activities are estimated to be \$2.7 million.

EXHIBIT 6. AVERAGE ADMINISTRATIVE CONSULTATION COSTS (2013\$)

INCREMENTAL ADMINISTRATIVE COSTS OF CONSULTATION					
CONSULTATION TYPE	SERVICE	FEDERAL AGENCY	THIRD PARTY	BIOLOGICAL ASSESSMENT	TOTAL COSTS
NEW CONSULTATION CONSIDERING ONLY ADVERSE MODIFICATION (UNOCCUPIED HABITAT)					
Informal	\$1,900	\$2,300	\$1,500	\$1,500	\$7,200
Formal	\$4,100	\$4,700	\$2,600	\$3,600	\$15,000
Programmatic	\$12,000	\$10,000	n/a	\$4,200	\$27,000
ADDITIONAL EFFORT TO ADDRESS ADVERSE MODIFICATION IN A NEW CONSULTATION (OCCUPIED HABITAT)					
Informal	\$620	\$780	\$510	\$500	\$2,400
Formal	\$1,400	\$1,600	\$880	\$1,200	\$5,000
Programmatic	\$4,200	\$3,500	n/a	\$1,400	\$9,100
<p>Source: IEC analysis of full administrative costs is based on data from the Federal Government Schedule Rates, Office of Personnel Management, 2013, and a review of consultation records from several Service field offices across the country conducted in 2002.</p> <p>Notes:</p> <p>1. The levels of effort per consultation represent approximate averages based on the best available cost information. The cost estimates in this report are accordingly rounded to two significant digits to reflect this imprecision. The cost estimates presented in this table may therefore not sum to the total costs reported due to rounding.</p> <p>2. Estimates reflect average hourly time required by staff.</p>					

³⁸ This calculation does not include the incremental costs of considering adverse modification during consultations also considering the jeopardy standard within the Service's consultation buffers. However, the additional administrative cost during such consultations is approximately \$5,000 per consultation, as shown in Exhibit 6. Making the conservative assumption that the same number of consultations occurs inside the Service's consultation buffers as outside, this would result in additional incremental costs of less than \$90,000 annually.

EXHIBIT 7. ANNUAL INCREMENTAL COSTS ASSOCIATED WITH OIL AND GAS ACTIVITIES
(2013\$)

UNIT	NAME	ESTIMATED ANNUAL COSTS
GRAHAM'S BEARDTONGUE		
1	Sand Wash	\$490,000
2	Seep Ridge	\$1,100,000
3	Evacuation Creek	\$550,000
4	White River	\$280,000
5	Raven Ridge	\$120,000
Subtotal Graham's Beardtongue		\$2,500,000
WHITE RIVER BEARDTONGUE		
1	North Evacuation Creek	\$150,000
2	Weaver Ridge	\$59,000
3	South Raven Ridge	\$5,900
Subtotal White River Beardtongue		\$220,000
GRAND TOTAL		\$2,700,000
<p>Notes: The cost per consultation represents an approximate estimate based on the best available cost information. The cost estimates in this report are accordingly rounded to two significant digits to reflect this imprecision. The unit cost estimates therefore may not sum to the total costs reported due to rounding.</p>		

OIL SHALE AND TAR SANDS DEVELOPMENT

In this section, we discuss the potential impact of the proposed designation on future oil shale and tar sands development.³⁹ First, we describe the location of these resources relative to proposed critical habitat and the existing regulations governing their development. Next, we discuss available data describing the likelihood of future development projects. Finally, we discuss potential impacts to specific planned projects overlapping proposed critical habitat.

Description and Location of the Resources

Oil shale and tar sands are accessed through mining activities. The process used to extract the oil from the mined material varies depending on the material. Generally:

- **Oil shale** is extracted using surface or underground mining methods and then transported to a facility for processing (called retorting) to extract the oil from the mineral rock. Although technically viable, this “ex situ” process has not yet been demonstrated on a commercially viable level in the United States.⁴⁰ Until recently, a private company, Shell Oil, had been developing an “in situ

³⁹Note, the terms “tar sands” and “oil sands” are used interchangeably throughout this report, depending on terminology used by the source being cited in a particular discussion.

⁴⁰U.S. Bureau of Land Management (2014).

conversion process” (ICP), which involves heating underground oil shale until it is released from the shale and then collecting it in wells.⁴¹ ICP is currently unproven at a commercial scale.^{42,43}

- In Canada, where commercial **tar sands** oil production currently occurs, oil is extracted from tar sands through open pit mining and transportation to an extraction plant, and through in situ methods. Both methods use water (or steam) to extract the oil. Because Canadian tar sands are water wetted, while U.S. tar sands are hydrocarbon wetted, the techniques used to extract the oil from the sand may be different in the United States.⁴⁴ Currently, oil is not produced from tar sands on a significant commercial level in the United States.⁴⁵

The largest deposits of oil shale in the world are found in the Green River Formation, which covers portions of Colorado, Utah, and Wyoming.⁴⁶ The largest deposits of tar sands are found in Canada and Venezuela, with much of the rest located in various countries across the Middle East. In the United States, tar sands resources are primarily concentrated in eastern Utah.⁴⁷

In 2012, BLM completed a Programmatic Environmental Impact Statement (PEIS) evaluating which public lands it should make available for application for oil shale and tar sands leasing. That document includes maps showing prospective resources. Exhibit 8 provides BLM’s information on the most geologically promising oil shale resources in the Uinta Basin in Utah and Colorado. Exhibit 9 shows the locations designated as Special Tar Sand Areas (STSAs) in the geologic reports prepared by the U.S. Geological Survey (USGS) in 1980 and formalized by Congress in the Combined Hydrocarbon Leasing Act of 1981.⁴⁸

In its Record of Decision (ROD), which relied on the PEIS, BLM concluded that 677,000 acres of Federal oil shale mineral rights (see Exhibit 8) (out of a possible 2 million acres) would remain open for application for Research Development and Design (RD&D) leases.⁴⁹ RD&D leases identify 160 acres for use for RD&D activities and allow applicants to identify an additional contiguous 4,960 acres of land to be reserved as preference right lease areas (PRLA) for future commercial development of oil shale resources.⁵⁰ Of the 431,000 acres of Federal mineral rights potentially

⁴¹ Ibid.

⁴² Ibid.

⁴³ A recent news reports suggests Shell Oil may have ended this in situ project. “The energy markets have evolved since we started the project in 1982,” said Kelly op de Weegh, a Shell spokeswoman. “We are exiting our Colorado project to focus on other opportunities.” The article states that Shell will apply what it has learned about oil shale to other parts of the world (Jaffe, 2013).

⁴⁴ U.S. Bureau of Land Management (2014).

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ U.S. Bureau of Land Management (2012), p. 1-11.

⁴⁹ U.S. Bureau of Land Management (2013).

⁵⁰ Ibid., 1-16.

available for the development of tar sands, BLM concluded that 130,000 acres (see Exhibit 9) would remain open for potential leasing.⁵¹

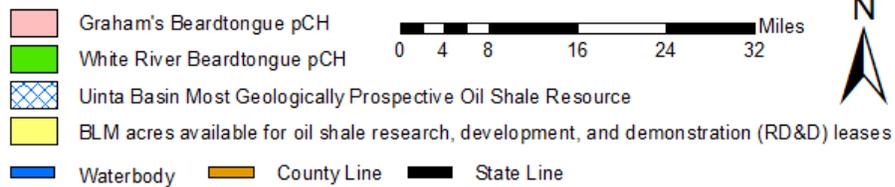
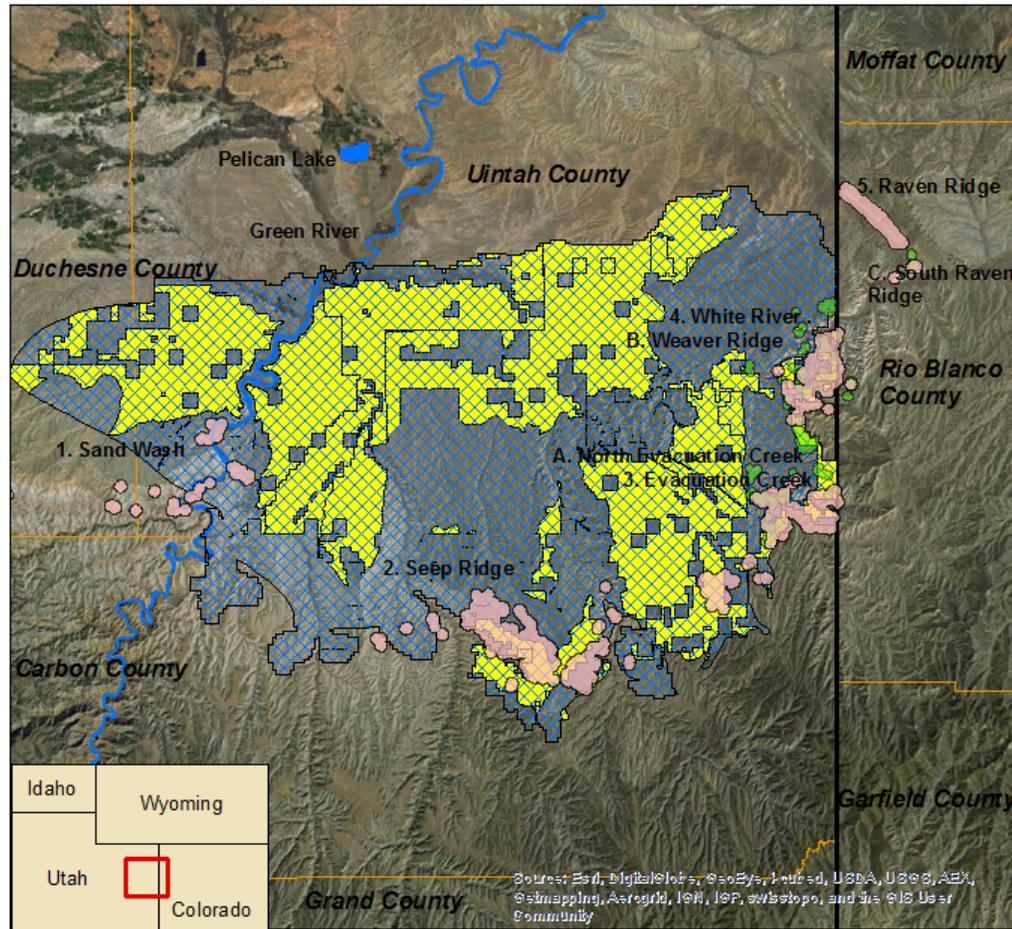
In its explanation of its decision, BLM states,

Development of oil shale and tar sands resources are relatively new programs. The BLM recognizes the potential importance of oil shale resources to the country, as well as the need for reliable, sustainable domestic oil-based energy resources. However, because development of oil shale resources, at this time, mainly consists of untested technology with potential long-term impacts on communities and the environment, the BLM has decided against leaving open large amounts of public land for future oil shale leasing and development prior to a meaningful evaluation of the results of the RD&D leases and development on non-Federal lands.⁵²

⁵¹ Ibid., pp. ES-1 and ES-10.

⁵² U.S. Bureau of Land Management (2013), p. 16.

EXHIBIT 8 BLM PEIS MAP OF GEOLOGICALLY PROSPECTIVE OIL SHALE RESOURCES

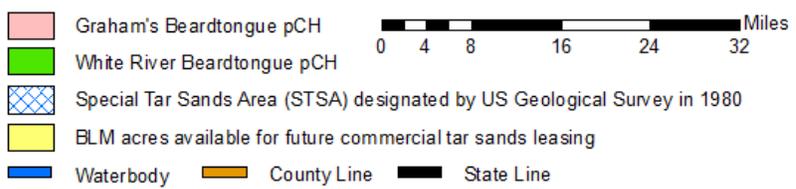
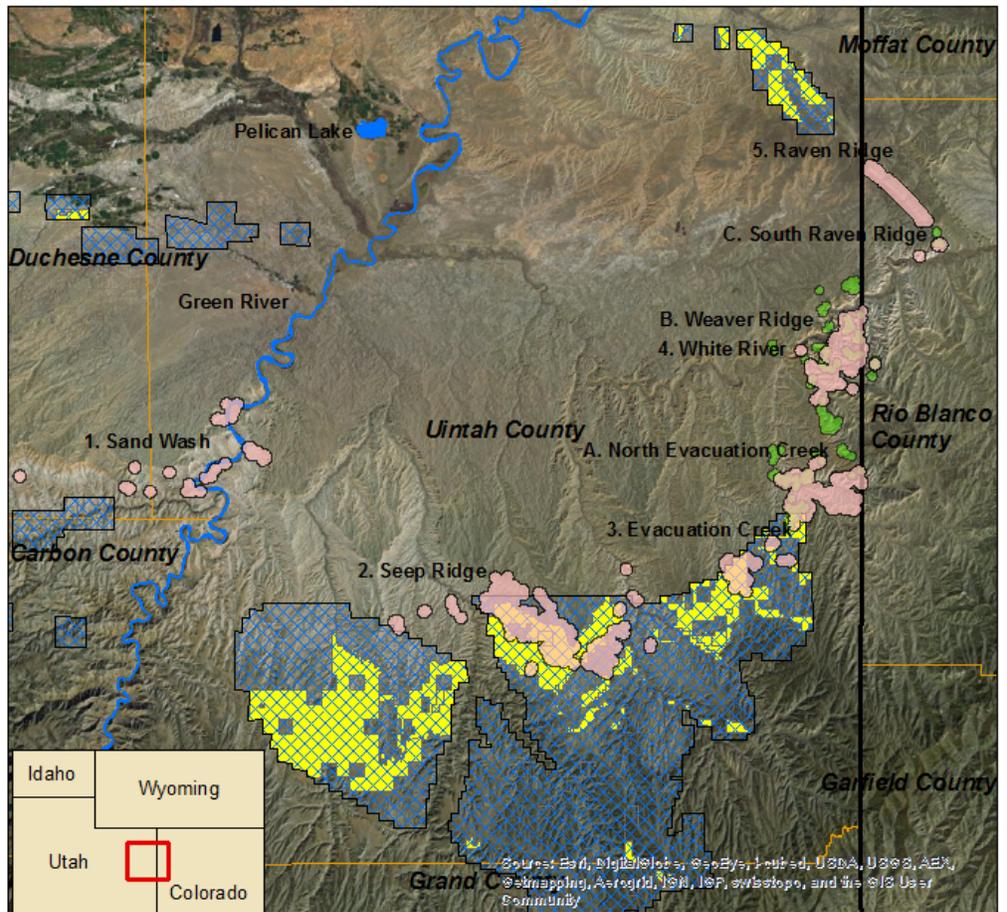


Note: unit names with numbers refer to Graham's pCH, while unit names with letters refer to White River pCH.

Sources:

1. US Fish and Wildlife Service, Utah Field Office
2. 2012 Oil Shale & Tar Sands Programmatic EIS
3. Environmental Systems Research Institute (ESRI), Redlands, California, USA

EXHIBIT 9 SPECIAL TAR SANDS AREAS IN UTAH



Note: unit names with numbers refer to Graham's pCH, while unit names with letters refer to White River pCH.

Sources:

1. US Fish and Wildlife Service, Utah Field Office
2. 2012 Oil Shale & Tar Sands Programmatic EIS
3. Environmental Systems Research Institute (ESRI), Redlands, California, USA

Substantial portions of proposed critical habitat fall within Federal oil shale and tar sands lease areas in Utah. Exhibit 10 summarizes the overlap; between 0 and 60 percent of a given unit overlaps these areas. In total, approximately 19,812 acres of proposed critical habitat fall within Federal lease areas for oil shale activity and 13,253 acres of proposed critical habitat fall within Federal lease areas for tar sand activity.⁵³ This represents approximately 5.5 percent of available Federal oil shale acres in Utah and approximately ten percent of available tar sands acres in Utah.

EXHIBIT 10 OVERLAP BETWEEN PROPOSED CRITICAL HABITAT AND FEDERAL LANDS AVAILABLE FOR OIL SHALE AND TAR SANDS LEASE APPLICATIONS

UNIT	NAME	PORTION OF CRITICAL HABITAT UNIT OVERLAPPING POTENTIAL LEASE AREAS
GRAHAM'S BEARDTONGUE		
1	Sand Wash	0%
2	Seep Ridge	38%
3	Evacuation Creek	39%
4	White River	22%
5	Raven Ridge	60%
Subtotal Graham's Beardtongue		33%
WHITE RIVER BEARDTONGUE		
1	North Evacuation Creek	39%
2	Weaver Ridge	19%
3	South Raven Ridge	0%
Subtotal White River Beardtongue		28%
Source: Proposed Critical Habitat Rule, 78 FR 47841-47844.		

Although the majority of domestic oil shale and tar sand resources are found on Federal lands, state or private lands may also provide an opportunity for development.⁵⁴ The UDOGM has oversight responsibility for oil and gas activities on these lands. In particular, leasing occurs on the state's School and Institutional Trust Administration Lands (SITLA). The lands are held in trust by the state and managed for the benefit of the public schools. Revenues from the land are saved in the permanent State School Fund.⁵⁵ In general, state and private lands are subject to fewer restrictions on oil shale and tar sands development than BLM lands.

⁵³ Note that these two values are not additive as 12,181 acres of proposed critical habitat overlap both Federal oil shale and tar sands leases in Utah.

⁵⁴ University of Utah (2013), pp. 5-6.

⁵⁵ Utah Trust Lands, School Land Trust (2014).

Likelihood of Future Development

The previous section describes the geologically prospective oil shale resources identified by BLM and the STSAs identified by USGS. In this section, we review available information describing the likelihood that the development of these resources will occur on a commercial scale in the reasonably foreseeable future. Based on available data, including public-sector and academic research and news reports, we generally consider a period of 10 years into the future. The significant uncertainty associated with this industry makes it difficult to forecast activity beyond this horizon.

The key data sources we use to inform this discussion include:

- The University of Utah’s Institute for Clean and Secure Energy 2013 report titled, *A Market Assessment of Oil Shale and Oil Sands Development Scenarios in Utah’s Uinta Basin*. This effort was funded by the U.S. Department of Energy’s (DOE) National Energy Technology Laboratory;
- Personal communications with the lead author of the University of Utah report and the DOE project manager;
- BLM’s 2012 PEIS;
- A 2013 study by HDR Engineering, Inc. (HDR) titled, *Final Report: Uinta Basin Energy and Transportation Study*;
- Public comments submitted by industry representatives; and
- Newspaper articles describing the various companies engaged in oil shale and tar sands development in the basin.

Market Assessment Research

In July 2013, the University of Utah’s Institute for Clean and Secure Energy published a report titled, *A Market Assessment of Oil Shale and Oil Sands Development Scenarios in Utah’s Uinta Basin*. The authors state, “Despite the size of the [oil shale and tar sands] resource and the fact that U.S. production of liquid transportation fuels from oils sands and oil shale has been shown to be technically feasible [1-3], there is currently no commercial scale production of either resource.”⁵⁶ The report investigates significant impediments to development and prepares four case studies of the per-barrel cost of oil produced from these resources.

The authors find that both in situ and ex situ oil shale and oil sands projects require extensive capital investments. Given their assumptions and the reference forecast of future oil prices prepared by the U.S. Energy Information Administration (EIA), both the ex situ oil shale and oil sands scenarios are profitable. However, the internal rate of return (IRR) is 11.6 percent for the ex situ oil shale scenario and 13.9 percent for the ex situ oil sands scenario, both of which are low considering the risk level of these projects.^{57,58} At slightly lower rates of return, the in situ oil sands scenario may also be

⁵⁶ University of Utah (2013).

⁵⁷ The State of Utah currently assumes an IRR of 11.64 percent for oil and gas projects involving conventional fuels (Utah State Tax Commission (2014)). According to Michael Hogue of the University of Utah, higher risk projects require higher

profitable. The in situ oil shale scenario is not profitable given current oil price forecasts.⁵⁹

Experts from the University of Utah and U.S. DOE agree that after some heightened interest in oil shale development approximately a decade ago, broad industry interest has waned. An expert at the University of Utah noted that the large capital cost associated with transitioning these projects to commercial scale requires outside investors. Potential energy investors have multiple investment options for their funding, particularly within the now booming industry producing oil and gas from shale formations in states like North Dakota and Pennsylvania.⁶⁰ In general, investors have turned their attention to these areas.

Given the (1) high costs associated with oil shale development relative to energy extraction from other unconventional sources; and (2) the considerable uncertainty associated with the likelihood that future world oil prices will be high enough to support acceptable returns on investment, developers in the Uintah Basin may have difficulty competing against these other locations for investors.⁶¹ Preference for the development of conventional oil and gas from unconventional shale formations is likely to be viewed more favorably at this time.⁶² As evidence of this shift, experts point to recent withdrawals from oil shale research, development, and demonstration projects in Colorado's Piceance Basin, where the oil shale resource is generally thicker and richer, by Chevron Corporation and Shell Oil Corporation.⁶³

expected returns as compensation (Email communication with Michael Hogue to Jennifer Spinti dated April 23, 2014, provided to IEc via email by Dr. Spinti on the same day.)

⁵⁸ University of Utah (2013), p. xxiii; and email communication with Dr. Jennifer Spinti, University of Utah, Institute for Clean and Secure Energy, April 22, 2014.

⁵⁹ University of Utah (2013), p. xxiii; and email communication from Dr. Jennifer Spinti, University of Utah, Institute for Clean and Secure Energy, April 22, 2014.

⁶⁰ "Oil shale" and "shale oil" refer to two different types of petroleum resources. "Oil shale" is comprised of an unconventional hydrocarbon resource known as kerogen located in an unconventional geologic setting (e.g., shale formations). Shale oil, an unconventional oil, is produced from oil shale by heating. "Shale oil" generally refers to conventional oil (e.g., a mixture of mainly pentanes and heavier hydrocarbons recoverable at a well from an underground reservoir and liquid at atmospheric pressure and temperature) extracted from unconventional shale formations, generally using processes such as hydraulic fracturing. While sometimes mistakenly interchanged, shale oil produced from "oil shale" and "shale oil" from shale formations such as the Bakken are different products.

⁶¹ Factors contributing to uncertainty regarding the economic viability of commercial-scale oil shale and oil sands production in the Uintah basin include: (1) future worldwide oil prices (prices of West Texas Intermediate, the comparison used in the study, are not currently high enough to support development according to the University of Utah study; however, the Energy Information Administration (EIA) reference forecast applied in the study suggests average prices over the long term would support minimum rates of return of nine to ten percent, depending on the technology applied); constraints on the capacity of transportation infrastructure in the basin; constraints on water availability to support production processes; and potential future domestic greenhouse gas regulations (University of Utah (2013), HDR Engineering (2013), University of Utah (2010)).

⁶² Personal communication with Robert Vagnetti, U.S. Department of Energy, National Energy Technology Laboratory on March 20, 2014. Note that Dr. Jennifer Spinti, University of Utah, Institute for Clean and Secure Energy, also provided a presentation given at the Institute's 2013 Unconventional Fuels Conference by Robert Wood, Partner, Renewable Tech Ventures (available at http://www.icse.utah.edu/assets/archive/2013/ucf_agenda.htm). The presentation provides information on investors' options and trends.

⁶³ Associated Press (2013).

BLM's Proposed Approach for Federal Resources

For Federal oil shale and tar sands resources, BLM's proposed approach for approving development reflects the uncertain state of this industry. BLM's PEIS and the resulting amendments to applicable Resource Management Plans (RMPs) are planning documents identifying where future development may occur. However, it is only the first in a multi-step decision-making process to approve future projects.

If an applicant wants to lease Federal oil shale or tar sands resources for development, each lease must undergo separate evaluation under the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA) and section 7 of the Act. BLM notes that this process is different than for traditional oil and gas leases, stating "the present experimental state of the oil shale and tar sands industries does not allow this PEIS for land use plan amendments to include sufficient site-specific information or cumulative impact analysis to support issuance of a lease."⁶⁴ In addition, after obtaining a lease, a project proponent must then submit an application to approve a plan of development, which also requires review under NEPA, NHPA, and section 7.

Thus, the total Federal acreage *available for potential leasing* should not be confused with the amount of total acreage that *will be developed* in the reasonably foreseeable future. In the PEIS, BLM notes, "A [reasonably foreseeable development scenario (RFDS)] is a critical component for the effects analysis required by NEPA, but the information contained in this PEIS is too speculative to permit adequate RFDSs for future leasing proposals."⁶⁵

Industry Perspective

The information obtained from the University of Utah, DOE, and BLM suggest that significant, commercial-scale development of oil shale or tar sands is highly uncertain in the next 10 years. However, several entities are actively pursuing research and development projects in the basin. These entities hold a more optimistic view of the potential for this industry in the near future.

As part of an assessment of the potential transportation constraints posed on the oil and gas industry in the Uinta Basin by the capacity of existing infrastructure, researchers at the University of Utah, working as part of the HDR project team, contacted six producers associated with seven oil shale mining sites either planned or under consideration in the basin. According to these producers, the first site would be built by 2015 and would produce 4,000 barrels per day (BPD), with expected growth of 25,000 BPD within seven years. The production level for each of the remaining sites ranges from 2,000 BPD to 25,000 BPD, and each site is expected to operate for 30 years. In total, these projects suggest the Uinta Basin would produce 131,000 BPD.⁶⁶

The researchers conducted similar interviews with six producers associated with six oil sands mining sites that are either planned or under investor consideration in the basin. Compared to oil shale sites, production rates at oil sands sites tend to be lower. The

⁶⁴ U.S. Bureau of Land Management (2012), p. 1-6.

⁶⁵ Ibid., p. 1-2.

⁶⁶ HDR Engineering, Inc. (2013), p. 36.

first oil sands site was anticipated to be built in 2013 with an initial production of 1,250 BPD and is expected to grow to 5,000 BPD within four years.⁶⁷ The production level for the remaining sites ranges from 250 BPD to 30,000 BPD, and each site operates for 30 years. At full production across all six sites, the Uinta Basin is expected to produce 70,000 BPD.⁶⁸

These predictions suggest that, ignoring potential constraints associated with the existing transportation system, significant production of unconventional fuels is expected by 2020. By 2025, oil produced by unconventional sources would surpass production from conventional wells.⁶⁹ However, the HDR study also finds that existing limitations in the transportation system will constrain overall production in the basin. HDR concludes the existing system may not be sufficient to support even baseline traffic by 2020, excluding new oil and gas trips. The authors state that new investment in transportation infrastructure is necessary to support the growth of this industry.⁷⁰

Regarding the University of Utah (2013) assessment of oil shale and oil sands production costs, information available from potential producers suggests a different outlook. The University of Utah study suggests potentially viable minimum rates of return are possible if the price of West Texas Intermediate (WTI)-quality crude oil follows the EIA reference forecast to 2035.⁷¹ This forecast suggests an average price of \$131.85 per barrel.⁷² In contrast, Red Leaf Resources, Inc. has developed an ex situ oil shale technology called EcoShaleTM that is claimed to be economically viable at prices greater than approximately \$50 per barrel.⁷³ Red Leaf Resources, Inc. is preparing to break ground on a commercial-scale Seep Ridge oil shale project (see discussion in the next section).

We asked the lead author of the University of Utah's market assessment to discuss the differences between cost estimates presented in her study and Red Leaf's reported production costs.⁷⁴ She noted that the product produced from oil shale, even after retorting, may require additional processing before it will be accepted by regional refineries. The same is true of oil sands, which produce bitumen. The cost estimates provided in the University of Utah study include all costs associated with delivering the product to market, including production, additional processing, transportation, taxes, royalties, and a return on investment. Red Leaf Resources, Inc. states the oil produced by its process "will be light (high API gravity) sweet (low sulfur) crude oil that should be excellent feedstock for ultra-low sulfur diesel fuel, the cleanest automobile fuel

⁶⁷ Currently, there is no production from the sites that were to have been online by now. (Email communication from Dr. Jennifer Spinti, University of Utah, Institute for Clean and Secure Energy, April 22, 2014.)

⁶⁸ HDR Engineering, Inc. (2013), pp. 36-37.

⁶⁹ *Ibid.*, p. 44.

⁷⁰ *Ibid.*, pp. 111 - 114.

⁷¹ University of Utah (2013), pp. xxiii.

⁷² *Ibid.*, p. 91.

⁷³ Red Leaf Resources, Inc. (2014b) and TomCo Energy (2014).

⁷⁴ Because there is no commercial scale oil shale production in the United States, at this time, all reported production costs are necessarily speculative.

available”; however, researchers at the University of Utah have never had the opportunity to test samples of Red Leaf’s product to confirm its quality.⁷⁵

Finally, we note that in public comments submitted in response to the proposed critical habitat rule, two potentially affected entities question the Service’s identification of oil shale and tar sands development as a significant enough threat to necessitate listing the plants. Uintah Gateway Holdings, LLC (see next section) states, “economic and technical uncertainties call into question large scale, rapid development on both public and private lands,” referencing the recent withdrawal of Shell Oil from its project in Colorado.⁷⁶ Similarly, Enefit American Oil (Enefit) proposes a new facility, referred to as the South Project, in proposed critical habitat (see next section) that is currently undergoing permitting. It writes, “Enefit’s intent to develop other projects in the Uintah Basin is directly dependent on the success of the South Project, which is itself by no means assured at this time.”⁷⁷

Thus, at this time, we conclude that considerable uncertainty exists surrounding the viability and timing of future oil production from oil shale and tar sands resources. Several projects are currently undergoing or have nearly completed the permitting process; we discuss these projects in greater detail in the next section. For the purposes of this analysis, we assume that it is unlikely that more than one project would begin operations in a given year. This assumption is consistent with existing data regarding the number and timing of contemplated projects over the next five years. Below, we summarize possible, known projects.

Currently Planned Projects

Enefit American Oil (Enefit)

According to its website, Enefit owns several properties within the vicinity of proposed critical habitat. BLM issued one RD&D lease for an oil shale development project in Utah in an area overlapping White River beardtongue Unit 2.⁷⁸ The lease was issued in 2007 for 10 years, with an option to extend up to another five years, to the Oil Shale Exploration Company, which was subsequently acquired by Enefit. According to the PEIS, RD&D Development Phase activities would be carried out on BLM RD&D lease property and Enefit’s adjacent private property.⁷⁹

However, in a public comment on the proposed critical habitat rule, Enefit states the project “will develop oil shale operations on up to 10,117 ha (25,800 ac) of private and

⁷⁵ Red Leaf Resources, Inc. (2014a); personal communication with Dr. Jennifer Spinti, University of Utah, Institute for Clean and Secure Energy, March 27, 2014; and email communication from Dr. Jennifer Spinti, University of Utah, Institute for Clean and Secure Energy, April 22, 2014.

⁷⁶ Parsons, Behle & Latimer, 2013, Public comment FWS-R6-ES-2013-0082-0015, October 7, p. 4.

⁷⁷ Enefit American Oil (2013b), pp. 2 and 7.

⁷⁸ During the first round of solicitations, when the Enefit project was selected, BLM selected five additional projects. All five are located in Colorado in the Piceance Basin, east of proposed critical habitat. During a second round of solicitations, BLM received three nomination packages, all of which were selected for further consideration. Two were in Colorado’s Piceance Basin. The third, submitted by Aurasource, was located in the Uintah Basin in Colorado. However, Aurasource “has not indicated a willingness to move forward in the lease approval process.” (U.S. Bureau of Land Management, 2012, p. 1-17).

⁷⁹ U.S. Bureau of Land Management, 2012, p. A-76.

State property using surface and subsurface mining techniques.”⁸⁰ The project is referred to as “the South Project” and overlaps Graham’s beardtongue Unit 3 and White River beardtongue Unit 1. Furthermore, Enefit states that while it has other land holdings and holds leases or lease options on other lands, it “has no pending proposed plans to develop those lands for commercial oil shale production. Rather, Enefit’s intent to develop other projects in the Uinta Basin is directly dependent on the success of the South Project, which is itself by no means assured at this time.”⁸¹

Enefit requires the use of a BLM right-of-way to access the property. Thus, despite the fact that it has limited its mining activities to state and private lands, a Federal nexus may exist for this project. Enefit is currently engaged in permitting activities, including preliminary scoping under NEPA for its utility corridor crossing BLM land.⁸²

Red Leaf Seep Ridge

Red Leaf holds 18 mineral leases for approximately 17,000 acres of state-owned and managed SITLA lands in the Uintah Basin, including “some of the best surface-mineable and richest oil shale in the United States.”⁸³ In 2009, the company successfully completed a pilot project, which produced more than 300 barrels of oil.⁸⁴ In 2012, the company received a large Mining Operation permit from the UDOGM, and in 2013, it received its Groundwater Discharge Permit from the Utah Division of Water Quality.⁸⁵ Thus, according to Red Leaf, “We are pleased to finally have the major permits required to move forward with construction of our commercial demonstration project, which will produce more than 300,000 barrels of oil and prove our clean oil shale technology works on a large scale.”⁸⁶ The proposed project appears to overlap Graham’s beardtongue Unit 2. However, the starting date for the project is currently uncertain due to a challenge from the Sierra Club and other groups to the issuance of the groundwater discharge permit.⁸⁷

TomCo Energy

TomCo Energy (TomCo) holds 2,915 acres of leases on SITLA lands.⁸⁸ In 2014, TomCo applied to the UDOGM for permits to mine its oil shale leases on approximately 1,280 acres of SITLA lands on the Holliday Block, approximately 15 miles east of Red Leaf’s proposed mine.⁸⁹ TomCo has licensed Red Leaf’s EcoShale™ technology for retorting. The TomCo site appears to overlap Graham’s beardtongue Unit 3.

⁸⁰ Enefit America Oil Company (2013a), p. 2.

⁸¹ Enefit America Oil Company (2013b), p. 7.

⁸² *Ibid.*, p. 2.

⁸³ *Ibid.*, A-89.

⁸⁴ Red Leaf Resources, Inc. (2013).

⁸⁵ *Ibid.*

⁸⁶ *Ibid.*

⁸⁷ Maffly (2014b).

⁸⁸ Based on GIS data of SITLA leases provided by the U.S. Fish and Wildlife Service via email on April 1, 2014.

⁸⁹ Maffly (2014a).

Ambre Energy Partners (formerly Oil Tech, Inc.)

Ambre Energy Partners (Ambre) acquired 33,000 acres of oil shale leases in Utah through a merger in 2008. It maintains a small research site, and approximately 70,000 tons of previously mined Mahogany Ridge oil shale have provided feedstock for its research and development efforts to date. According to BLM, “the company is currently monitoring opportunities to participate in oil shale development in the region.”⁹⁰ Portions of its leases overlap Graham’s beardtongue Unit 2 and White River beardtongue Unit 2.

Uintah Gateway Holdings, LLC

Uintah Gateway “owns in fee simple, or controls through options or leases, the surface rights and associated mineral rights to oil shale reserves located in eastern Utah and western Colorado, including the area proposed to be designated as critical habitat for the Penstemon. These property rights specifically include, among others, Uintah Gateway’s recently purchased oil shale rights and mineral lease from the Utah School and Institutional Trust Lands Administration (“SITLA”). If and to the extent oil shale development becomes economically feasible, Uintah Gateway plans to mine and process these reserves in the future.”⁹¹

Private Landowner

A pair of private landowners in Colorado submitted a public comment stating that their land in Colorado, which overlaps proposed critical habitat, is currently under lease for oil shale development.⁹² They raised concern that because a Clean Air Act permit would likely be required for development of the resource, restrictions might be imposed. The landowner did not provide additional detail about the likelihood a developer would obtain permits to mine the lease. Thus, we do not know whether such activities are likely on this property. Furthermore, the landowner did not identify the proposed critical habitat unit overlapping the property.

Potential Impact on Known Planned Projects

Whether and how the above referenced projects would be affected by proposed critical habitat depends on the following: (1) whether a Federal nexus exists; and (2) the degree to which the project overlaps incremental pollinator habitat and the types of incremental project modifications the Service might recommend. Below, we address each of these factors. Then, we apply this information to the Enefit project to estimate likely incremental impacts in a single year.

Federal Nexus

Any projects involving Federal mineral rights will require a lease and permits from BLM. Proposed critical habitat only overlaps Federal mineral rights for oil shale and tar sands in Utah. Similar mineral rights in Colorado are not located within proposed critical habitat for the beardtongues.

⁹⁰ U.S. Bureau of Land Management (2012), A-55.

⁹¹ Uintah GatewayHoldings, LLC (2013).

⁹² Arentz and Light (2013).

Whether a Federal nexus exists for projects on SITLA or private lands is uncertain. Given the checkerboard pattern of Federal and state lands in the West, access to these lands often requires a right-of-way through Federal property. The decision to grant this right-of-way is a Federal action and potentially creates a nexus for consideration of impacts to critical habitat in section 7 consultation. Furthermore, mining activities may require water discharge permits under the Clean Water Act. However, the Red Leaf example, where water discharge permits were issued by the State, suggests that such a nexus is unlikely. The Red Leaf project, which has received all its major permits, did not involve any conferencing with the Service, despite the candidate status of the plants.

Incremental Project Modifications

Unlike traditional oil and gas projects, the Service’s Utah Field Office does not have prior experience consulting on oil shale and tar sands projects. However, staff state that the baseline consultation buffer of 300 feet applied to traditional oil and gas projects is unlikely to be sufficient for assessing the impacts of oil shale and tar sands operations on known plant occurrences. In the baseline, they anticipate consulting on projects within 500 meters of a known occurrence of either beardtongue.⁹³ As a result, any projects with a Federal nexus overlapping proposed critical habitat for the White River beardtongue are likely to require consultation with the Service in the baseline (see Exhibit 11). For Graham’s beardtongue, the incremental pollinator buffer includes distances between 500 and 700 meters from a known plant occurrence.

EXHIBIT 11. CONSULTATION BUFFER AND POLLINATOR BUFFER BY SPECIES IN UTAH AND COLORADO: OIL SHALE AND TAR SANDS DEVELOPMENT

	UTAH AND COLORADO	
BUFFER TYPE	GRAHAM’S	WHITE RIVER
Consultation	500 meters	500 meters
Pollinator	700 meters	500 meters
Source: U.S. Fish and Wildlife Service (2014); personal communication with the U.S. Fish and Wildlife Service, April 2, 2014.		

For projects with a Federal nexus that overlap incremental pollinator habitat for the Graham’s beardtongue, the Service anticipates requesting that the project proponent conduct on-site weed control and plant an appropriate mix of native species during site reclamation.⁹⁴ In Exhibit 5, we report such activities cost \$99,000 per well pad (2013

⁹³ Email communication with the U.S. Fish and Wildlife Service, April 2, 2014.

⁹⁴ Ibid.

dollars). Available information suggests each well pad was associated with a 209 acre area, suggesting a per acre cost of \$470.⁹⁵

Likely Recommendations for the Enefit South Project

As discussed above, in the near term, it is unlikely that more than one oil shale or tar sands project will occur in a given year. It appears that the Red Leaf project is closest to beginning operations; however, this project does not appear to have a Federal nexus, as all its major permits have already been issued. The next most likely project appears to be the Enefit South project.

A Federal nexus exists for the Enefit South project due to its need for a right-of-way across BLM land. The Service considers the mine site, which is located on SITLA and private land, to be a connected project. Assuming that the future consultation considers the entire project, we use data provided by Enefit to the Service to estimate the overlap between the South Project site and the incremental pollinator buffer for Graham's beardtongue. In total, approximately 1,656 acres of the site overlap proposed critical habitat, of which 267 acres overlap incremental pollinator buffer. Assuming the entire incremental pollinator buffer is disturbed during the project, we estimate the cost of on-site weed control and re-seeding would total approximately \$130,000, assuming the entire area is treated in a single year. Adding the incremental cost (\$5,000) of considering critical habitat in a consultation results in a total incremental project cost of approximately \$130,000.⁹⁶ These costs are relatively small because the portions of the Enefit site overlapping proposed critical habitat are almost entirely within the baseline consultation buffer (e.g., within 500 meters of known plant occurrences).

Conclusion

Substantial uncertainty exists regarding the timing, location, and intensity of future oil shale and tar sands development. Because the relevant technology has not yet been demonstrated at a commercial scale, and given competing demands for energy investments in other parts of the country, we assume that initiation of more than a single project in a given year is unlikely in the next ten years. Using the Enefit project as a case study, we estimate that, if a Federal nexus exists, incremental section 7 costs could be \$130,000 in a given year.

GRAZING

This section presents our analysis of impacts of the proposed designation on livestock grazing activities. As described in the Proposed Rule, the Service considers livestock grazing to be a threat to the species when considering the cumulative impacts of this activity along with other threats.⁹⁷ This analysis focuses on grazing on public lands, as grazing activities on privately-owned ranches typically lack a Federal nexus for section 7 consultation.

⁹⁵ OXY's estimate of \$99,000 per well pad was derived from its project at the Mt. Callahan Saddle Natural Area. It planned 15 well pads in a 3,130 acre area (3,810 acres overlapped Unit 3 of that proposed rule, minus 680 acres set aside as a preserve). We assume an average of 209 acres per well pad (Clark, 2011).

⁹⁶ Costs do not sum due to rounding to two significant digits.

⁹⁷ 2013 Proposed Critical Habitat Rule, 78 FR 47832

BLM manages 28 grazing allotments that overlap with the proposed critical habitat designation. Grazing on these allotments is authorized through the issuance of grazing permits that specify authorized or permitted “animal unit months” (AUMs) of livestock use, or the amount of forage that may be consumed by one cow and calf during one month.

The Service generally recommends the following conservation measures to reduce grazing-related threats to the species and their habitat:

- Conducting surveys to determine species presence/absence and monitoring to determine impacts on the long-term viability of the plants;
- Limiting grazing to winter and early spring in allotments where the species occur;
- Locating water sources and mineral supplements away from plants and habitat and prohibiting trailing of livestock within habitat to avoid trampling; and
- Implementing a “rest period” of at least one full year every third year in pastures where the species occur.⁹⁸

According to the Service, all of the above conservation measures would be recommended due to the presence of Graham’s beardtongue and White River beardtongue, regardless of critical habitat designation.⁹⁹ Therefore, it is unlikely that critical habitat designation will result in incremental costs to grazing associated with conservation measures.

We anticipate that in 2014, following critical habitat designation, the Service will enter into a programmatic section 7 consultation with BLM to consider grazing activities. The additional administrative cost of considering critical habitat as part of this programmatic consultation is considered an incremental cost of the designation. Exhibit 12 presents the incremental costs by unit (costs of the consultation are divided evenly across the units overlapping BLM land). Total costs are estimated to be \$9,000 (2013 dollars).

⁹⁸ Personal communication with Botanist, Utah Field Office, U.S. Fish and Wildlife Service, on February 24, 2014.

⁹⁹ Ibid.

EXHIBIT 12. INCREMENTAL COSTS ASSOCIATED WITH GRAZING ACTIVITIES (2013\$)

UNIT	NAME	ESTIMATED COSTS
GRAHAM'S BEARDTONGUE		
1	Sand Wash	\$1,100
2	Seep Ridge	\$1,100
3	Evacuation Creek	\$1,100
4	White River	\$1,100
5	Raven Ridge	\$1,100
Subtotal Graham's Beardtongue		\$5,600
WHITE RIVER BEARDTONGUE		
1	North Evacuation Creek	\$1,100
2	Weaver Ridge	\$1,100
3	South Raven Ridge	\$1,100
Subtotal White River Beardtongue		\$3,400
GRAND TOTAL		\$9,000
Notes: The level of effort per consultation represents approximate averages based on the best available cost information. The cost estimates in this report are accordingly rounded to two significant digits to reflect this imprecision. The unit cost estimates therefore may not sum to the total costs reported due to rounding		

SECTION 4. OTHER COSTS OF THE CRITICAL HABITAT RULE

This section discusses the potential for incremental costs to occur outside of the section 7 consultation process. These types of costs include triggering additional requirements or project modifications under state laws or regulations, and perceptual effects on markets. These types of impacts may occur even when activities do not have a Federal nexus for consultation.

ADDITIONAL STATE REGULATION

Indirect incremental impacts may occur if the designation of critical habitat increases awareness of the presence of the species or the need for protection of their habitat. In Colorado, the Colorado State Land Board (SLB) takes into account the presence of federally-listed species and critical habitat when prescribing land management practices; however, no SLB lands fall within critical habitat.¹⁰⁰ The presence of federally-listed species and critical habitat does not impact the permitting decisions of the Colorado Oil and Gas Conservation Commission (COGCC), the state agency

¹⁰⁰ Personal communication with Mindy Gottsegen, Stewardship Trust/Conservation Services Manager, State of Colorado, State Land Board, on February 18, 2014.

charged with regulating oil and gas activities within the state.¹⁰¹ Currently, Utah state agencies do not have authority to prescribe land use practices for the benefit of rare plants, and no conservation measures are expected to occur for the beardtongues or their critical habitat outside of the section 7 process.¹⁰²

We therefore assume that the designation of critical habitat is unlikely to trigger state-level impacts, for projects lacking a Federal nexus, as a result of increased awareness of the species and their habitat. The Service did not receive any public comments on the proposed rule suggesting this conclusion was incorrect.

POSSIBLE IMPACTS OF PUBLIC PERCEPTION

Comments received regarding proposed critical habitat rules in various locations throughout the United States indicate that the public perceives critical habitat designation as possibly resulting in incremental changes to private property values, above and beyond those associated with specific forecast project modifications under section 7 of the Act.¹⁰³ These commenters believe that, all else being equal, a property that is inhabited by a threatened or endangered species, or that lies within a critical habitat designation, will have a lower market value than an identical property that is not inhabited by the species or that lies outside of critical habitat. This lower value results from the perception that critical habitat will preclude, limit, or slow development, or somehow alter the highest and best use of the property. Public attitudes about the limits and costs that the Act may impose can cause real economic effects to the owners of property, regardless of whether such limits are actually imposed. Over time, as public awareness grows of the regulatory burden placed on designated lands, particularly where no Federal nexus compelling section 7 consultation exists, the effect of critical habitat designation on properties may subside.

In the case of proposed critical habitat for the beardtongues, the habitat is located in remote areas where residential development pressure is low. Thus, the value of these lands is driven by their next best surface use, in this case, grazing. Despite the fact that a section 7 nexus is unlikely for grazing activities conducted on private acres, the ranching community may perceive that the designation of certain parcels as critical habitat will limit future grazing activities in those areas. In addition, private landowners hold renewable leases that are both inheritable and transferrable with the sale of the land, or in the case of BLM permits, the transfer of livestock (pending the approval of the BLM). Thus, impacts to grazing on Federal acres may affect the value of connected private holdings.

¹⁰¹ Personal communication with David Kubiczko, Oil and Gas Location Assessment Specialist, Colorado Oil & Gas Conservation Commission, on February 20, 2014.

¹⁰² In Utah, while no state agency-mandated conservation measures currently occur and will not occur in the future for federally-listed plant species, significant conservation occurs for federally-listed wildlife such as the sage grouse, as a result of the recommendations of state agencies. Source: personal communication with Bill James, Energy Development/NEPA Coordinator, Utah Department of Natural Resources, Division of Wildlife Resources, on February 21, 2014.

¹⁰³ See, for example, public comments on the possible impact of designating private lands as critical habitat for the Northern spotted owl (as summarized in *Industrial Economics, Incorporated* (2012b), p. 5-21) and the cactus ferruginous pygmy owl (as summarized in *Industrial Economics, Incorporated* (1999), p. 44).

To evaluate the possible magnitude of such costs, we conduct an analysis to determine the total perpetuity value of the livestock that could be supported by all privately-owned land and associated Federal leases in the proposed critical habitat designation (i.e., AUMs). Public perception may diminish land values by some percent of these total values. Data limitations prevent us from estimating the size of this percent reduction or its attenuation rate due to public perception.

The total perpetuity value of current grazing activity represents the upper bound on possible costs rather than a best estimate of likely costs. Assuming the entire value of these AUMs (i.e., all economic activity associated with the parcel) is lost would likely overstate impacts and is not supported by the limited existing academic literature investigating endangered species-related public perception effects.¹⁰⁴ In addition, these properties may experience similar perception-related effects for other reasons, including the presence of the listed beardtongues in the occupied areas, reducing the incremental portion of the impact attributable to beardtongues critical habitat.

To estimate the grazing activity supported by privately-owned land within the designation, this analysis relies on a 1989 study prepared for the California Department of Forestry and Fire Protection profiling the California Livestock Industry. As part of the study, the productivity of grazing lands for privately owned or leased land was compared to the productivity of land leased from USFS and BLM. On average, depending on vegetation type, this study found that private lands range from being as productive to up to 17 times as productive as USFS and BLM grazing lands. To establish an upper bound of total AUMs supported by privately-owned land within the proposed critical habitat designation, our analysis applies a multiplier of 17 to the average number of AUMs per acre for the 24 active grazing allotments that overlap critical habitat in BLM allotments. In addition we estimate the value of Federal allotments that could be associated with privately-owned properties due to their geographic proximity. Using private non-irrigated grazing fee rates for livestock specific to each state affected by the designation, we conclude that the total value of grazing that could be supported by the 28 grazing allotments within the proposed designation is unlikely to exceed \$100 million.¹⁰⁵

SECTION 5. SECTION 7 AND OTHER ECONOMIC BENEFITS

The primary intended benefit of critical habitat is to support the conservation of threatened and endangered species, such as the beardtongues. As described in the previous sections of this memorandum, the designation may result in incremental conservation efforts for the beardtongue during oil and gas activity, including minimization of surface disturbance, control of noxious weeds, and implementation of native revegetation, and surveys for areas currently not occupied by the species. Various economic benefits may result from these incremental conservation efforts, including: (1) those associated with the primary goal of species conservation (i.e. direct benefits), and (2) those additional beneficial services that derive from conservation efforts but are not the purpose of the Act (i.e. ancillary benefits).

¹⁰⁴ For a discussion of the available literature describing potential perceptual effects resulting from the Act, see Industrial Economics, Incorporated (2014).

¹⁰⁵ For additional detail describing our analysis of perceptual effects, see Industrial Economics, Incorporated (2014).

In order to quantify and monetize these benefits, information would be needed to determine (1) the incremental change in the probability of beardtongue conservation expected to result from the designation, and (2) the public’s willingness to pay for such beneficial changes.¹⁰⁶ Although numerous published studies estimate individuals’ willingness to pay to protect endangered species, we are not aware of any published studies that estimate the value the public places on preserving the beardtongues.¹⁰⁷ In addition, we do not have information on the expected change in species population levels that may result from critical habitat designation for the beardtongue. Lacking these data, we are not able to quantify the primary species conservation benefit of the critical habitat designation.

We therefore provide a qualitative summary of the categories of benefits that may result from implementation of the incremental conservation efforts described in this memorandum. Exhibit 13 provides information on these ancillary benefits and where they are expected to occur. In addition to the benefits listed in Exhibit 13, the maintenance or enhancement of use and non-use values for coexisting species, or for biodiversity in general, may also result from the incremental conservation efforts for the beardtongues.

EXHIBIT 13. POSSIBLE INCREMENTAL CONSERVATION EFFORTS FOR THE BEARDTONGUES AND ASSOCIATED BENEFITS

POSSIBLE INCREMENTAL CONSERVATION EFFORT	ASSOCIATED BENEFITS	RELEVANT UNITS
Minimization of surface disturbance	Ecosystem health for coexisting species	All
Control of noxious weeds	Ecosystem health for coexisting species	All
Native revegetation	Ecosystem health for coexisting species	All
Surveys	Educational benefits	All
Note: All conservation efforts are intended to support the survival and/or recovery of the species.		

SECTION 6. SUMMARY

This analysis estimates section 7 costs likely to result from the proposed critical habitat designation for the beardtongues. The analysis forecasts the total number of future consultations likely to occur for oil and gas development (traditional and unconventional) and grazing activities undertaken by or permitted by Federal agencies within proposed critical habitat. In addition, the analysis forecasts costs associated with conservation efforts that may be recommended in consultation for oil and gas activities occurring in pollinator habitat. The total quantifiable incremental section 7 costs

¹⁰⁶ For a detailed discussion of these data limitations, see Flight and Unsworth, Industrial Economics, Incorporated (2011).

¹⁰⁷ See, for example, Loomis and White (1996).

associated with the proposed designation are estimated to be approximately \$2,900,000 (2013 dollars) in a given year.

In terms of other costs, this analysis concludes that the designation of critical habitat is unlikely to trigger additional requirements under state or local regulations. In addition, this analysis is supplemented by a separate memorandum assessing the potential perceptual effects on grazing. This analysis concludes that the aggregate value of grazing activities on these lands, when combined with the costs quantified above, is less than \$100 million.

The magnitude of benefits is also highly uncertain, and quantification would require primary research and the generation of substantial amounts of new data, which is beyond the scope of this memorandum and Executive Order 12866.¹⁰⁸

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