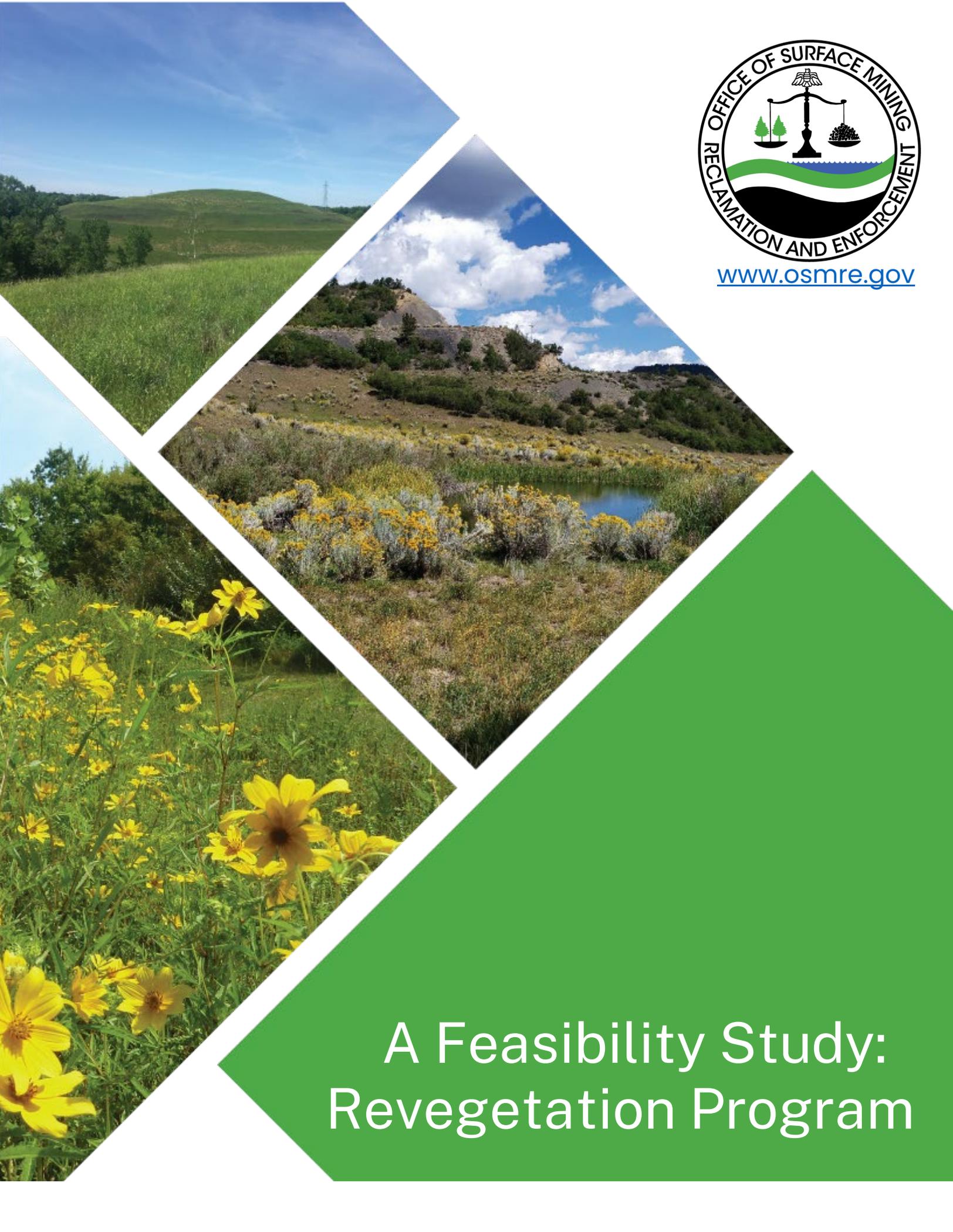




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A Feasibility Study: Revegetation Program

Date of Report: November 14, 2022

A report presenting the results of a study analyzing the feasibility of a revegetation program operated by the Office of Surface Mining Reclamation and Enforcement, prepared to comply with Section 40802 of the Infrastructure Investment and Jobs Act (Pub. L. No. 117-58). The report is not a budget document and does not imply support or approval of any specific action or investment. All activities and recommendations included in the report are subject to the Administration's annual budget formulation process, including resource constraint and policy priority considerations, as well as the availability of appropriations provided by Congress.

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Cover Photos: Top left, a photo of Snow Hill, IN, after reclamation.
Lower left, A photo of wildflowers on a reclaimed site in West Virginia.
Center, The North Thompson Creek Phase III termination of jurisdiction bond release inspection in Colorado. Wildlife (ungulates, ducks, snakes, and others) use this area regularly, and it is valuable habitat, including functioning wetlands.

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Executive Summary

Congress, through the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (BIL) (Pub. L. No. 117-58), directed the Office of Surface Mining Reclamation and Enforcement (OSMRE) to investigate the feasibility of revegetating reclaimed mine sites on a programmatic scale. The study included mine sites subject to Title IV of the Surface Mining Control and Reclamation Act of 1977 (SMCRA), as well as mine sites not subject to that title.

SMCRA regulatory authorities and abandoned mine land (AML) programs do not currently track or record information specifically about reclaimed mine sites that need, or would benefit from, revegetation. Consequently, without conducting individual assessments of each site or extensive sampling, it is impossible to identify with any degree of scientific certainty the number of sites or acreages that need or would benefit from a revegetation program of reclaimed mine sites. However, based on the experience of SMCRA practitioners, supported by State and federal data, OSMRE was able to identify a sufficient number of reclaimed mine sites where opportunities for revegetation might exist that could benefit from a revegetation program.

To quantify reclaimed mine sites where opportunities for revegetation might exist, OSMRE first considered Title IV mine sites, *i.e.*, sites abandoned or not adequately reclaimed before enactment of SMCRA. The data needed to obtain a refined estimate of sites or acreage that would benefit from revegetation is limited. A search of the data available focused on Title IV sites with land associated with a specific feature in need of reclamation, including mine benches, clogged stream lands, highwalls, slides, and spoil areas. OSMRE identified as many as 22,000 Title IV sites nationwide that might provide revegetation opportunities.

In addition, OSMRE looked for mine sites not subject to Title IV that have postmining land uses conducive to the restoration of native habitat such as forestland, wildlife habitat, and undeveloped land. Most of these mine sites were reclaimed with program standards and reclamation techniques available at the time. SMCRA practitioners have since learned that excessive soil compaction and aggressive ground cover can hinder the establishment of native habitat. OSMRE also looked at bond forfeiture sites previously permitted for surface coal mining activities under SMCRA's Title V program. In some cases, for various reasons, vegetation was successfully established on these sites, but did not develop into a self-sustaining natural habitat. The data needed to obtain a refined estimate of sites or acreage that would benefit from revegetation is unavailable. OSMRE identified as many as 14,000 older reclaimed sites nationwide and 5,000 bond forfeiture sites that could be examined for revegetation opportunities.

OSMRE conducted a literature review and determined that the techniques to reestablish native species on formerly mined lands are well documented and successfully demonstrated. Moreover, OSMRE evaluated State and federal programs, including collaborations with non-government organizations (NGOs), local entities, and academia for revegetating mine lands. OSMRE concludes that the technical capability exists to implement a nationwide revegetation program for reclaimed mine lands.

OSMRE assessed its existing programs and administrative capabilities to determine if any program or a combination of program components could be used to structure a revegetation enhancement program. OSMRE decided that no single existing program would be ideal for administering the revegetation program. The use of Title IV, AML funds is restricted to pre-SMCRA mine sites. On those sites, only work required to eliminate the hazard can be performed with traditional fee-based or BIL AML funds in uncertified States, and depending on the hazard, may not include more revegetation than is required to mitigate the hazard. On Title V permitted sites, once a mine site is reclaimed to standards, the bond is released and the regulatory authority's jurisdiction over the site is terminated. However, OSMRE did determine that its Abandoned Mine Land Economic Revitalization (AMLER) program and its Watershed Cooperative Agreement Program (WCAP) could serve as models for the successful distribution of funds to States, Tribes, NGOs, and other qualifying entities. These models achieve environmental improvements as a complement to the existing SMCRA regulatory and AML programs. Moreover, OSMRE determined that the Appalachian Regional Reforestation Initiative (ARRI) and Green Forests Work (GFW) serve as good models for cooperation with NGOs and other entities interested in and available to enhance vegetation on reclaimed mine sites. OSMRE, States, and Tribes have invested years in reclaiming mines, contributing to the development of coalfield communities and the well-being of the people who live there. OSMRE has concluded that an effective program with beneficial results could be developed and implemented.

OSMRE solicited input from States and Tribes with coal mining, AML reclamation programs, industry, NGOs, and the public concerning the feasibility and benefits of a revegetation program for reclaimed mine sites. The input OSMRE received identified concerns that should be taken into account when developing any vegetation enhancement program, as well as the opportunities created by and possible benefits of such a program. In addition, this input indicated that a revegetation program should be voluntary, initiated over a reasonable timeframe, and provide resources to assist in its implementation and operation. While the input received acknowledged that a revegetation enhancement program could provide benefits within local economies, the anticipated degree of economic benefit varied greatly.

OSMRE determined that an effective revegetation enhancement program could be developed to promote environmental, economic, and community benefits by:

- Restoring reclaimed mined lands (Title IV and Title V sites) to native habitats;
- Encouraging best management practices for revegetation of reclaimed mine sites through outreach and cooperation between programs;
- Improving outdoor recreational opportunities by restoring natural habitats; and
- Generating economic development through job creation and increased eco-tourism opportunities.

A revegetation enhancement program would require funding through Congressional appropriations for administration at the Federal, State, and Tribal levels. A phase-in period to develop program guidance and implementation instructions cooperatively with States, Tribes, NGOs, and other stakeholders would enhance implementation time and efficiency. A revegetation enhancement program could direct additional funds as optional grants to States and

Tribes, as they are in the best position to prioritize and select sites for revegetation. A program could also provide NGOs and other qualifying entities with revegetation funding from OSMRE under cooperative agreements. Any new program that provides grants to States and Tribes should require reporting through annual oversight reports, while NGOs and others should provide reports upon the completion of a given project and at designated intervals.

Barriers to implementation include:

- inconsistent and incomplete datasets on reclaimed mine sites in need or that can benefit from revegetation;
- lack of understanding among the public and landowners regarding the benefits of revegetating mine sites;
- staffing and capacity among States and Tribes to develop and implement the program;
- absence of a system for prioritizing sites in a manner acceptable to States, Tribes, NGOs, and OSMRE;
- shortage of contractors and necessary resources (i.e., plant materials, soil amendments) to conduct revegetation work; and
- lack of clarity on landowner responsibility, limitations, or liability associated with federally funded reclamation/revegetation.

Conclusion

OSMRE has concluded that, in partnership with States, Tribes, and NGOs, implementing a program to revegetate reclaimed mine sites is technically and administratively feasible. OSMRE also identified sites that are potentially suitable for revegetation. A revegetation program could produce environmental, economic, and community benefits. Program benefits would include the restoration of native habitats, the creation of employment opportunities related to revegetation work, and the potential development of outdoor recreational opportunities on revegetated mine sites.

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Section 1: Introduction and Background Information

The United States has an abundance of lignite, subbituminous, bituminous, and anthracite coal. The availability of these resources and a massive influx of immigrants in the 18th and 19th centuries coincided with technological advances allowing the U.S. to assume a leading role in the industrial revolution. Coal provided fuel for processing raw materials, producing end products, and transporting products to markets.

For two centuries, no consistent regulations existed that would protect the public and the environment from the adverse effects of coal mining. During that time, coal operators would commonly conduct mining with little thought on how the mining would impact the environment, and there were no requirements to reclaim sites after mining ceased, which would often leave sites unusable, devoid of vegetation, and contaminated with acid mine drainage (AMD). In the latter half of the 20th century, the U.S. took stock of the environmental cost of coal mining. On August 3, 1977, the Surface Mining Control and Reclamation Act of 1977 (SMCRA), Public Law No. 95-87, was signed into law by President Jimmy Carter. Section 201 of SMCRA established the Office of Surface Mining Reclamation and Enforcement (OSMRE) as a bureau within the U.S. Department of the Interior. SMCRA created two significant programs: A program to reclaim lands and waters adversely affected by coal mines abandoned before the law's enactment (Title IV) and a regulatory program to ensure that active surface coal mines operate in a manner that protects citizens and the environment from any adverse impacts associated with those mining operations (Title V).

Pursuant to SMCRA, a State may acquire the primary responsibility (i.e., primacy) for the regulation of surface coal mining and reclamation operations on non-Federal and non-Indian lands within the State, while a Tribe may acquire primacy over surface coal mining and reclamation operations on its lands. To obtain primacy, a State or Tribe must develop a regulatory program that meets the minimum standards set forth in SMCRA and the Federal regulations, as approved by the Secretary of the Interior. After a State or Tribe achieves primacy, OSMRE primarily assumes an oversight role and provides funding and technical assistance to support the States and Tribes in the operation of their programs. If a State or Tribe does not have primacy, OSMRE operates a Federal regulatory program in that State¹ or a Federal Indian lands program on Indian lands.

SMCRA requires all coal mining operations to apply for and obtain permits from a State or Tribe (if the State or Tribe has primacy) or from OSMRE before mining. A State, Tribe, or OSMRE will issue a permit to an operator after reviewing the operator's permit application and finding that it demonstrates that the mining operation will comply with all performance standards, including achieving an approved postmining land use. Operators must then provide financial assurance, typically in the form of a performance bond, to ensure compliance with all

¹ If a State has primacy but has not entered into a cooperative agreement with OSMRE about regulating surface coal mining operations on Federal lands, OSMRE would also operate a Federal regulatory program on Federal lands within that State.

reclamation standards. When all performance standards are met, the regulatory authority can approve the release of the performance bond and terminate jurisdiction over the mine site.

Since the passage of SMCRA forty-five years ago, OSMRE, States, and Tribes have learned a significant amount through site reclamation, technical studies, and technical assistance. During this time, SMCRA regulatory authorities have observed that successful reclamation comes in many forms and does not always include returning the site to its native habitat. Under SMCRA, the landowner and permittee determine the postmining land use². Some example postmining land uses include, but are not limited to:

- Commercial,
- Residential,
- Farmland or cropland, and
- Recreation.

The States and Tribes, OSMRE, and other federal agencies (such as the Bureau of Land Management (BLM) and U.S. Forest Service (USFS)) work together with academia and other entities to develop better ways to revegetate previously mined lands, such as the Forestry Reclamation Approach (FRA),³ a set of best-management practices that use native vegetation and soil reclamation techniques to improve restoration.⁴

Title IV of SMCRA created the AML Program, which was designed to restore lands impacted by coal mining before the enactment of SMCRA. A State or Tribe that meets the criteria established in SMCRA may submit a reclamation plan to the Secretary of the Interior. Once the Secretary approves its reclamation plan, a State or Tribe may operate an AML program. To fund the AML Program, OSMRE collects a fee from coal operators on each ton of coal produced in the United States. In accordance with SMCRA, OSMRE deposits these fees into the Abandoned Mine Reclamation Fund and distributes most of the funds to States and Tribes with approved AML programs. OSMRE also offers technical assistance to State and Tribal AML programs and conducts reclamation of AML sites in States and on Indian lands not covered by an approved State or Tribal AML program. In general, to be eligible for reclamation under Title IV of SMCRA, a site must have been “mined for coal or . . . affected by such mining, waste banks, coal processing, or other coal mining processes . . . and abandoned or left in an inadequate reclamation status before August 3, 1977, and for which there is no continuing reclamation responsibility under State or other Federal laws.”⁵

SMCRA establishes a prioritization system for the reclamation of these sites based on the degree of adverse health and safety effects they contain. The priority categories are as follows:

- **Priority 1 (P1)** - An AML problem meeting the conditions under section 403(a)(1) of SMCRA concerning the protection of public health, safety, and property from the extreme danger of adverse effects of coal mining practices or adjacent land and water reclamation.

³ For an explanation of OSMRE’s policy about Reforestation of Title IV and Title V Mined Lands, see <https://www.osmre.gov/sites/default/files/pdfs/directive931.pdf>.

⁴ [Forest Reclamation Advisory #11](#)

⁵ 30 U.S.C. § 1234.

- **Priority 2 (P2)** - An AML problem meeting the conditions under section 403(a)(2) of SMCRA concerning the protection of public health and safety from adverse effects of coal mining practices or adjacent land and water reclamation.
- **Priority 3 (P3)** - An AML problem category meeting the conditions under section 403(a)(3) of SMCRA concerning the restoration of land and water resources and the environment previously degraded by adverse effects of coal mining practices.

The AML Program prioritizes public health and safety over environmental issues. Consequently, in States where the AML program has not certified complete reclamation of all the priority coal problems, referred to as uncertified States, AML fee-based funding is only available to mitigate the hazards associated with AML sites and cannot be used for any additional work. Furthermore, according to section 402(g)(7) of SMCRA, uncertified States and Tribes cannot use AML fee-based funding to restore a Priority 3 site unless it is adjacent to a higher priority site or until all known Priority 1 and 2 sites have been restored. Although great strides have been made to address AML sites under SMCRA, many of these sites remain and still adversely impact the environment and public. However, these sites do not represent a failure of the AML Program, as sites can only be addressed as funds become available, and work must be limited to mitigating hazards and not full reclamation.

The Infrastructure Investment and Jobs Act (Public Law No. 117-58), commonly known as the Bipartisan Infrastructure Law (BIL), was enacted on November 15, 2021. The BIL authorized and appropriated \$11.293 billion for deposit into the Abandoned Mine Reclamation Fund. Of the \$11.293 billion appropriated, OSMRE will distribute approximately \$10.873 billion in BIL AML grants to eligible States and Tribes on an equal annual basis—roughly \$725 million a year—over 15 years. BIL moneys may be used to fund coal reclamation projects, including Priority 1, 2, and 3 projects, water supply restoration projects, and emergency projects. In contrast to the AML fee-based program, Priority 3 projects are eligible for BIL funding whether or not the project is in conjunction with other projects classified as Priority 1 and Priority 2 under SMCRA Title IV.

Congress has appropriated funding each fiscal year beginning in 2016 for the Abandoned Mine Land Economic Revitalization (AMLER) Program (formerly known as the AML Pilot Program), which is intended to accelerate the remediation of AML sites with economic and community development end uses in mind. AMLER grants may be used for other economic and community revitalization and reclamation activities which could include the revegetation of reclaimed sites. Many, if not most, of the communities where AMLER projects undertaken are disadvantaged communities targeted by the Justice40 Initiative. The Justice40 Initiative, established by President Biden in Executive Order 14008, made it a goal that disadvantaged communities receive 40 percent of the overall benefits of certain Federal investments. States and Tribes are encouraged to equitably fund and prioritize projects that will assist in achieving the goal of the Justice40 Initiative. A new revegetation program could address economic and community development end-use goals in these communities in conjunction with revegetation needs and opportunities.

Report Authorization

In section 40802 of the BIL, Congress directed OSMRE to study the feasibility of revegetating or enhancing vegetation on unreclaimed and reclaimed mine sites nationwide. Section 40802 of the BIL states:

SEC. 40802. STUDY AND REPORT ON FEASIBILITY OF REVEGETATING RECLAIMED MINE SITES.

(a) **IN GENERAL.**—Not later than 1 year after the date of enactment of this Act, the Secretary of the Interior, acting through the Director of the Office of Surface Mining Reclamation and Enforcement, shall conduct, and submit to Congress a report describing the results of, a study on the feasibility of revegetating reclaimed mined sites.

(b) **INCLUSIONS.**—The report submitted under subsection (a) shall include—

(1) recommendations for how a program could be implemented through the Office of Surface Mining Reclamation and Enforcement to revegetate reclaimed mined sites;

(2) identifications of reclaimed mine sites that would be suitable for inclusion in such a program, including sites on land that—

(A) is subject to title IV of the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1231 et seq.); and

(B) is not subject to that title;

(3) a description of any barriers to implementation of such a program, including whether the program would potentially interfere with the authorities contained in, or the implementation of, the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.), including the Abandoned Mine Reclamation Fund created by section 401 of that Act (30 U.S.C. 1231) and State reclamation programs under section 405 of that Act (30 U.S.C. 1235); and

(4) a description of the potential for job creation and workforce needs if such a program was implemented.

This report presents the results of OSMRE's feasibility study and fulfills the requirements of section 40802 of the BIL. No additional resources were provided to undertake the feasibility study or this report. A working group of 11 existing staff members contributed to this report, including subject matter experts from various fields such as hydrology, forestry, soils, geology, ecology, environmental restoration, geographic information systems, engineering, and congressional affairs. In addition, OSMRE received significant contributions from AmeriCorps members.

Assumptions, Limitations, & Delimitations

Given the time and resource constraints, the feasibility study was limited to a review of existing information and was not completed in the same manner as an academic research study. Although some components of this report use scholarly reference materials, the feasibility study relied on existing data and the collective experience of OSMRE, States, Tribes, and other stakeholders in managing nationwide reclamation programs.

For purposes of the feasibility study and this report, to assess the need for a revegetation program, OSMRE examined State and Federal databases to identify reclaimed mine sites where opportunities for revegetation might exist, including sites mined before and after the enactment of SMCRA. The available data for AML sites helped OSMRE identify the location and character of the sites themselves; however, this data lacked detailed acreages or specific information about the historic or current vegetation status on reclaimed AML sites. Generally, information about the current vegetation status of unreclaimed AML sites was unavailable. For older reclaimed sites, OSMRE reviewed available data collected by States before bond release; however, important information, such as postmining land use and current vegetation status, could not readily be obtained. For bond-forfeited sites, OSMRE reviewed available data collected by States. This information was typically better because a State evaluates reclamation requirements when a permit is revoked and a bond is forfeited. However, like older reclaimed sites, data on the current vegetation status for bond forfeiture sites are not available once reclaimed. Due to time and resource constraints, OSMRE did not review individual permit files or visit individual sites. Without conducting individual assessments of each site, OSMRE could not identify with scientific certainty the number of sites or acreages that need or would benefit from a revegetation program of reclaimed mine sites.

The feasibility study was not designed for, nor intended as, a review of existing or past revegetation requirements under SMCRA, Federal, or State regulations.⁶

⁶ In general, coal mining permittees must establish on regraded areas and on all other disturbed areas except water areas and surface areas of roads that are approved as part of the postmining land use, a vegetative cover that is in accordance with the approved permit and reclamation plan and that is: (1) Diverse, effective, and permanent; (2) Comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use and approved by the regulatory authority; (3) At least equal in extent of cover to the natural vegetation of the area; and (4) Capable of stabilizing the soil surface from erosion. See 30 C.F.R. §§ 816.111-116; 817.111-116.

Section 2: Needs Assessment

Benefits of Revegetation

The benefits of revegetation or vegetation enhancement on reclaimed mine sites include, but are not limited to:

Restoration of Native Habitat

Habitat loss and fragmentation have significantly impacted the function of native ecosystems. Restoration of native habitats provides wildlife with food, cover, and water and reestablishes connectivity in migratory routes. This connectivity results when large openings are restored to native habitats. Pollinator species also benefit from restoration through planting native flowering ground covers and flowering trees, especially those that flower late in the growing season.

Increased Biodiversity

Many of the disturbances caused by humans create early successional wildlife habitat or transitions between habitat types, such as forest edges known as edge effects or ecotones. This habitat often benefits generalists, which are wildlife species that do not have specific ecological needs but can live in various habitats. Generalists have few environmental threats and can overtake habitats preferred by more site-specific species. Restoring specific habitat types that existed before mining will help increase biodiversity. Targeted restoration can revive imperiled animal species by recreating their specific habitat needs.

Carbon Sequestration and Storage

A healthy ecosystem will sequester and store more carbon than an unhealthy ecosystem, and this benefit applies not just to native forests but also to other types of native vegetation, including grasslands. For example, the conditions created by using the FRA allow newly planted trees to grow faster, increasing the carbon accumulation rate in plant tissues and the soil. Trees growing on adequately prepared mine soils using the FRA can grow faster than trees growing on unmined land, which allows the trees on reclaimed mined land to sequester and store more carbon than trees growing on unmined land.

Improved Water Quality

Native habitats provide an excellent filter for water. Ripping compacted mine soils allows for more significant water infiltration and storage. This process reduces surface water runoff which can transport sediment downgradient. Vegetation can also absorb and store metals and minerals that cause water quality problems.

Moderation of Surface Water Runoff and Reduction of Downstream Flooding

The loosening of compacted soil allows more water to infiltrate the soil and results in less surface water runoff. In addition, healthy vegetation will absorb water and intercept

precipitation, reducing inputs to downstream systems. Flooding is common on steep topography, especially downstream from large mining complexes where soils were compacted. Mitigating compaction on mined lands helps establish native habitats and, on appropriate sites, can help restore the hydrologic balance; as a result, runoff from these mine sites is moderated, resulting in less downstream flooding.

With these benefits in mind, OSMRE sought to identify reclaimed mine sites where revegetation or vegetation enhancement opportunities exist. As directed by Congress, OSMRE considered enhanced revegetation opportunities on mine sites subject to Title IV of SMCRA (AML sites) and lands not subject to that title.

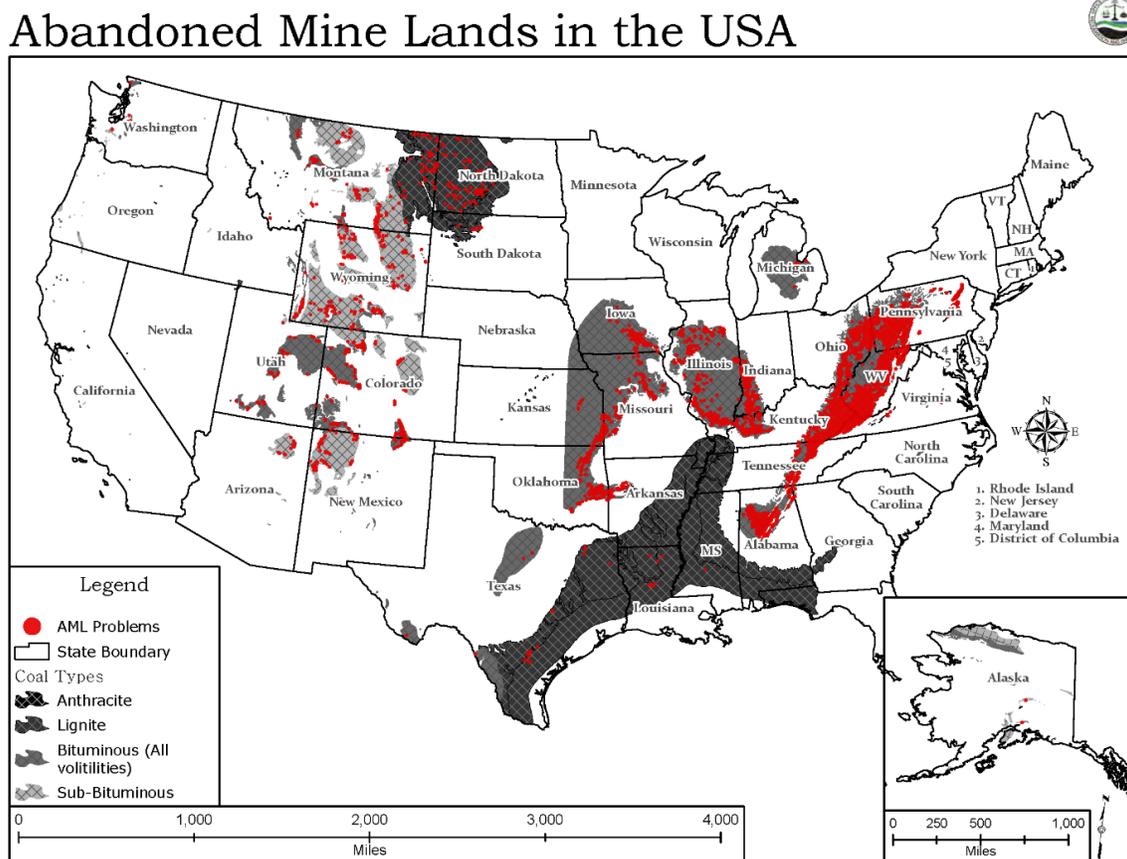
AML Sites

OSMRE first looked at coal mine sites on lands subject to Title IV of SMCRA (AML sites). As these sites are identified by State, Tribal, and OSMRE AML reclamation programs, pertinent information is entered into the enhanced Abandoned Mine Land Information System (e-AMLIS). This computer system, maintained by OSMRE, is used to store, manage, and report lands and waters adversely impacted by historical (i.e., pre-1977) coal mining operations. This system includes problems in need of reclamation and those that have been reclaimed. OSMRE used e-AMLIS as the primary source of information for AML sites used in this study.

E-AMLIS is intended to inventory and track the reclamation status of pre-SMCRA mine sites. The system is not configured for data analysis. Moreover, the system is designed to focus on AML problems, referred to as features, needing reclamation based on the priority system referenced above. Therefore, e-AMLIS does not contain information, such as acreages for sites not yet reclaimed or the status of vegetation, that would have been useful for refining the estimates identified in this feasibility study.

The map below shows all identified AML sites on Federal, State, Indian, or private lands to show the distribution of AML sites across the country and their relationships to coal basins (Figure 1).

Figure 1
National Map



For this study, OSMRE examined all AML priority types to determine if potential revegetation opportunities exist;⁷ specifically, OSMRE identified the number of potentially suitable sites by looking at AML features listed in e-AMLIS that may have acreages associated with them that could benefit from revegetation once the AML feature is addressed. It is important to note that under the AML Program, only work required to eliminate the hazard can be performed with traditional fee-based or BIL AML funds in uncertified States, and depending on the hazard, may not include more revegetation than is required to mitigate the hazard⁸. Therefore, revegetation efforts on these sites are limited to those necessary to eliminate hazards. Extra effort or cost, such as that needed to establish native vegetation, is limited under these AML programs. As such, the following features present the most significant potential opportunities for a supplemental program focused on revegetating AML sites once the

⁷ States and Tribes are not required to enter P3 sites into e-AMLIS before reclamation and were not incentivized to do so until recent substantial increases in AML (BIL) funding made the large-scale reclamation of P3 sites possible. Those P3 sites that were recorded in e-AMLIS and examined by this study represent potential revegetation opportunities.

⁸ OSMRE Directive AML-1, Abandoned Mine Land Inventory System, A-94 (Dec. 12, 2012) ("Estimated costs must be only those costs that would result from a reasonable approach to abating the impact of the AML problem."); see OSMRE Notice of revised guidelines for abandoned mine land reclamation programs and projects, 66 Fed. Reg. 31250 (Jun. 11, 2001).

underlying AML feature is addressed: clogged stream lands; dangerous highwalls; dangerous impoundments; dangerous piles and embankments; dangerous slides; benches; gob; highwalls; pits; spoil areas; slurry; and slumps.⁹

OSMRE extracted data for the P1, P2, and P3 features matching the identified categories that were listed in e-AMLIS as of March 28, 2022.¹⁰ The data indicated that there were 4,272 P1 features, 9,360 P2 features, and 8,689 P3 features, for a total of 22,321 AML sites nationwide that might provide an opportunity for revegetation or enhanced revegetation.

In addition to the data limitations of e-AMLIS identified above, a significant impediment to this estimate is that some of the sites listed will have been adequately revegetated, either through planned revegetation efforts or natural succession. Moreover, some sites will not be amenable to disturbance due to soil characteristics, hydrological concerns, or structural limitations. Another significant consideration is that most of these sites are on privately owned land, and landowner approval would be required to implement a revegetation initiative successfully. Finally, other AML sites not captured in the general categories selected to generate the initial estimate may also benefit from revegetation or vegetation enhancement. As previously stated, the estimates provided are not presented with any scientific certainty. These estimates would require funded investigation, research, and analysis to refine. Nevertheless, this universe of potential opportunities is appropriate for the high-level conceptual analysis and discussion in this report.

Three regional AML maps showing specific site locations and their reclamation status (Figures 2, 3, and 4) have been provided. These maps show each site's reclamation status, indicating sites that could potentially be revegetated or enhanced in the short term (reclamation complete) and those that would require reclamation before revegetation. OSMRE highlighted the reclamation status of P1 or P2 AML features because the cost of reclaiming these sites typically exceeds simple revegetation. For example, a P1 dangerous highwall that has been reclaimed and revegetated with non-native vegetation would be immediately suitable for vegetation enhancement, whereas an unreclaimed highwall would require significant earth moving before it could be revegetated.

AML sites where reclamation is complete should have a vegetative cover, but in many cases, that vegetative cover is not native to the vicinity. As previously discussed, the AML Program primarily focuses on mitigating hazards and does not necessarily extend to re-establishing native habitats. Sites requiring earth moving would require more work before revegetation but would provide more opportunities to create well-paying jobs. The regional maps also include a table showing the number of sites possessing each feature within each state.

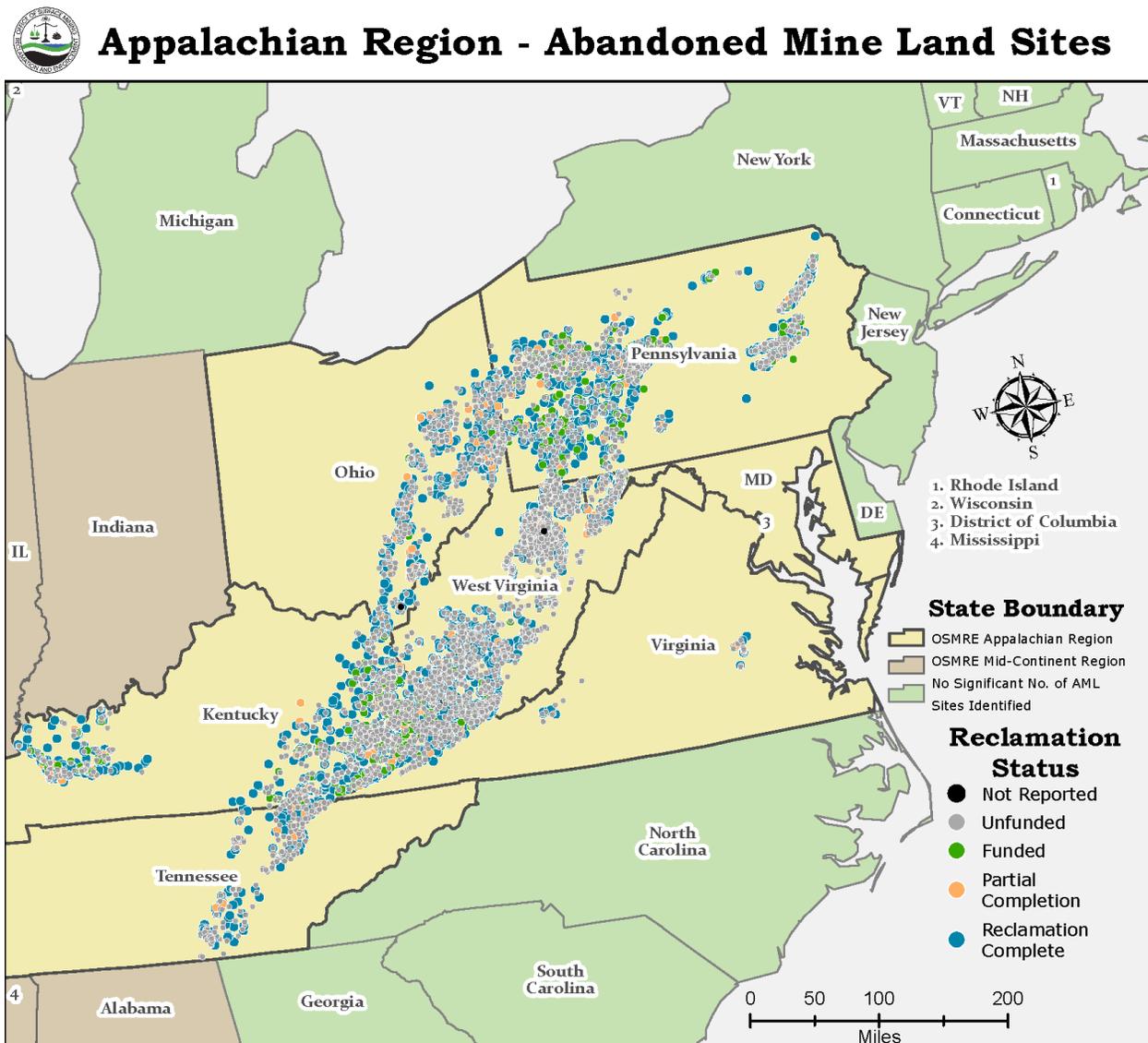
Features identified as "In Reclamation: Funded" or "In Reclamation: Partial Completion" are in the process of being reclaimed. Features identified as "Reclamation Complete" were revegetated using traditional fee-based funds and would, in many cases, be immediate candidates

⁹ OSMRE considered short-term and long-term water treatment to be outside the scope of a revegetation program; thus, those sites were not evaluated.

¹⁰ The data changes daily as sites are reclaimed and new sites are added to the inventory.

for vegetation enhancement. Features identified as “Reclamation Pending: No Funding” or “Reclamation Pending: Unfunded” would likely require significant earth moving before revegetation.

Figure 2
Appalachian Region—Abandoned Mine Lands



Problem Type	Kentucky	Maryland	Ohio	Pennsylvania	Tennessee	Virginia	West Virginia
P1 Clogged Stream Lands	46	6	59	3	1	49	19
P1 Dangerous Highwalls	81	5	188	218	8	74	26
P1 Dangerous Impoundments	51	3	26	32	1	42	173
P1 Dangerous Piles & Embankments	73	2	41	102	7	9	108
P1 Dangerous Slides	1,489	20	211	38	16	186	291
P2 Clogged Stream Lands	405	38	276	54	2	169	35
P2 Dangerous Highwalls	116	55	245	1,162	112	91	866
P2 Dangerous Impoundments	132	13	13	33	3	33	733
P2 Dangerous Piles & Embankments	173	41	29	347	52	63	540
P2 Dangerous Slides	397	25	171	126	19	104	214
P3 Bench	126	7	5	4	112	120	17
P3 Gobs	72	73	87	121	49	166	224
P3 Haul Road	11	2	-	2	53	97	10
P3 High Wall	7	48	44	171	57	298	610
P3 Other	54	20	12	123	7	21	43
P3 Pits	31	7	31	150	189	9	14
P3 Slump	22	6	4	79	2	22	25
P3 Slurry	6	-	1	18	1	-	3
P3 Spoil Area	223	55	148	608	205	114	82

Figure 3
Mid-Continent Region—Abandoned Mine Lands

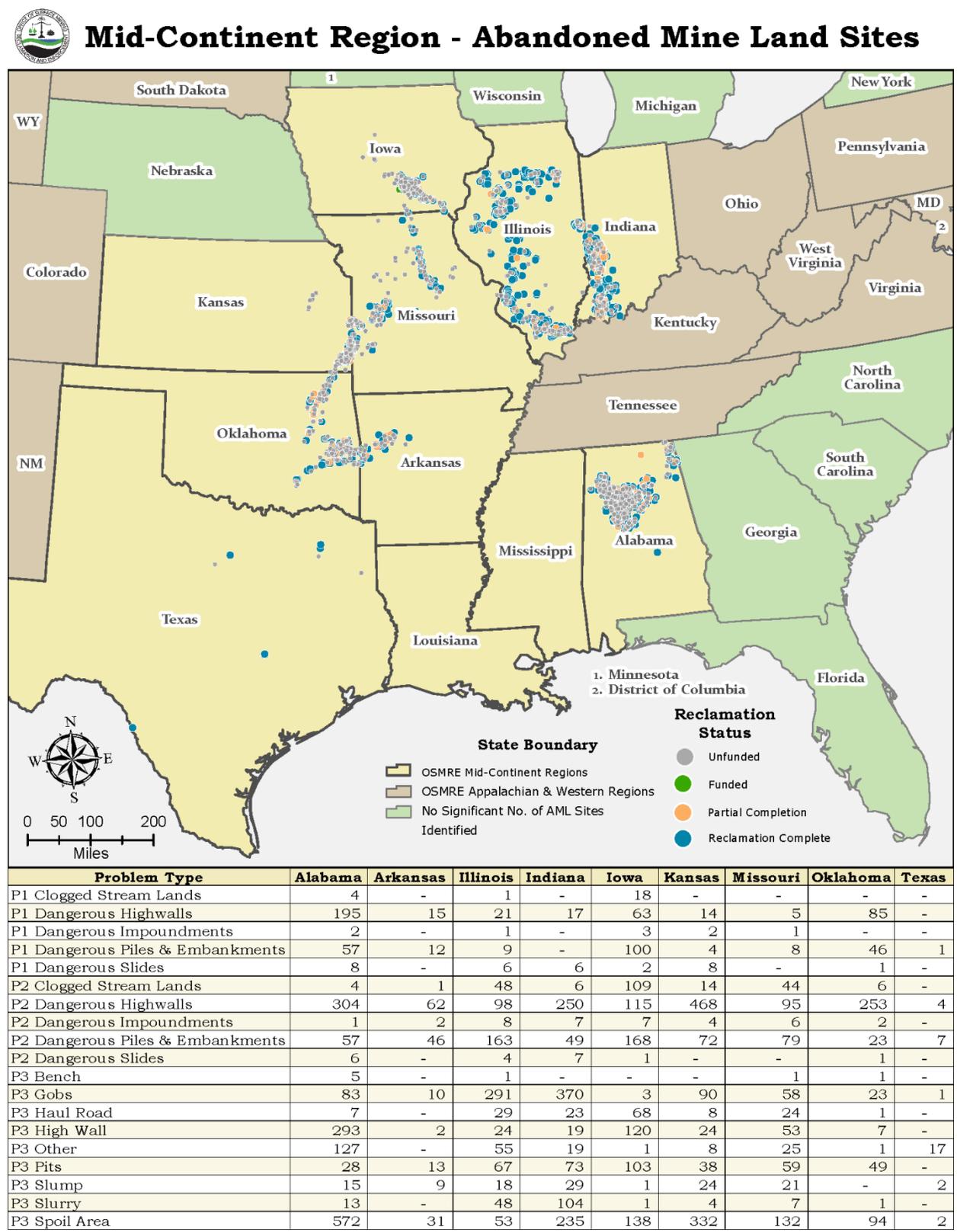
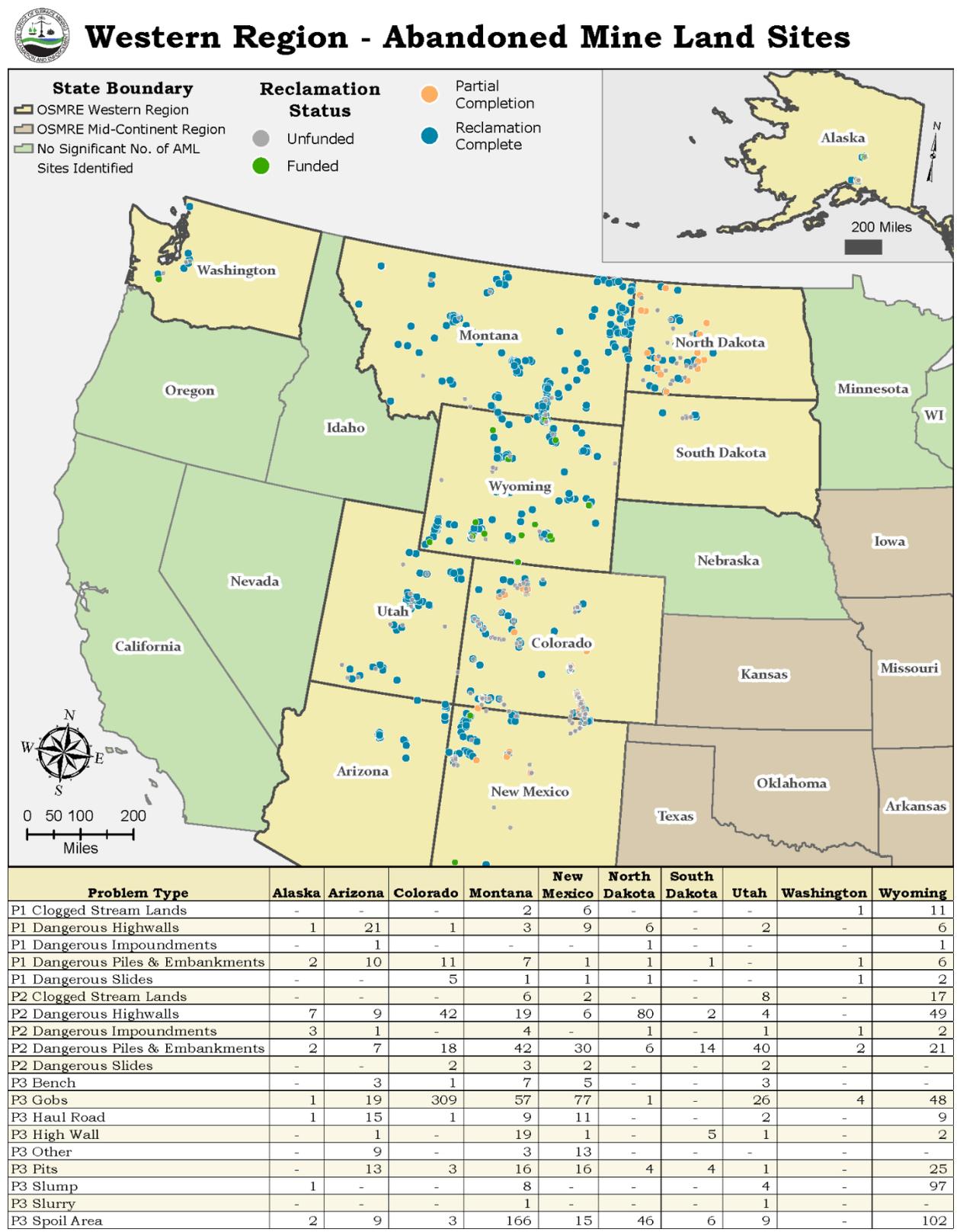


Figure 4
Western Region—Abandoned Mine Lands



Other Reclaimed Mine Sites Not Subject to Title IV

After identifying Title IV AML sites that might provide an opportunity for revegetation or enhanced revegetation, OSMRE identified revegetation opportunities on reclaimed mine sites not subject to Title IV. These sites include lands permitted under Title V of SMCRA that were mined, successfully reclaimed, and the bond(s) or financial assurance securing performance were released. Title V sites where bonds were forfeited and the regulatory authority undertook the reclamation and revegetation with the funds recovered were also included.

SMCRA requires that vegetation specified under the postmining land use be well established before the regulatory authority releases the bond. A five- or ten-year period of successful growth over the permitted area, depending on annual average precipitation, is required before final bond release can occur. 30 U.S.C. § 1265(b)(20)(A). These mine sites may differ from their pre-mining condition with respect to topography, soils, water resource influences, and vegetation, and reclamation may not have reestablished the natural habitat of the locality. Even after the SMCRA standards are met and the bond released, these sites sometimes do not develop into self-sustaining native habitats. With landowners' permission, such sites may be candidates for revegetation or vegetation enhancement.

Once legal requirements for bond release and termination of jurisdiction under SMCRA are met, monitoring or tracking of mine sites is generally no longer required, and no new records are typically entered for that site. Both primacy States and OSMRE maintain files for mine sites where a performance bond was forfeited. These files typically contain more complete information because the regulatory authority develops estimates of reclamation costs when the bond is forfeited. OSMRE collected sample information from these files to identify sites with land reclamation liabilities.

The primary sources for Title V site information were permit file databases maintained by primacy States and OSMRE. All State permit files are accessible by OSMRE. However, while States are constantly working to improve accessibility to electronic file databases, the availability of data that can be extracted and analyzed varies considerably between States. Records are maintained prior to bond release, but no requirement exists requiring those records to be updated following bond release. Unfortunately, most State databases did not include sufficient information to determine if sites may be suitable for a revegetation program, and those States' mine sites have not been included in the estimate.¹¹ OSMRE intended to exclude certain postmining land uses that could not be restored to their natural habitat. For example, approved commercial, industrial, or residential postmining land uses would not be restored to reflect pre-mining conditions. However, State databases do not include postmining land uses. Therefore, all Title V sites were considered and included in the scoping estimates presented in the feasibility study.

¹¹ OSMRE requested information from States to supplement the data extracted from their files. The information provided was primarily qualitative in nature. While this information could not be used to identify suitable sites, it is discussed in this report.

OSMRE limited its data search to Title V sites reclaimed before 2004 when the FRA was implemented. Since that time, OSMRE, the States, and industry have placed a greater emphasis on the preparation of soil supporting the type of planted vegetation and the use of native species during the reclamation of mine sites because of advances in science and lower reclamation costs using FRA. In the Appalachian Region (AR), this was accomplished under the ARRI. The Mid-Continent (MCR) and Western Regions (WR) have native habitats predominantly anchored by vegetation other than trees (e.g., shrubs and grasses) and perform similar work to the AR.

OSMRE extracted information from State and OSMRE file systems that could be readily accessed within the timeframe available for the feasibility study. OSMRE pulled data from these databases during June and July 2022 for pre-2004 Title V sites. Nationwide, in the accessible systems, there were 14,274 bond-released sites and 40 sites categorized as unknown, for a total of 14,314 non-bond forfeiture sites¹². There were also 4,632 sites identified as abandoned or forfeited where the regulatory authority utilized proceeds from performance bonds and financial assurance collected from the operator to perform reclamation.¹³

As stated previously, these numbers do not represent the number of mine sites that need or would benefit from enhanced revegetation. Instead, this universe of mine sites presents a starting point for exploring the opportunity to identify and develop more self-sustaining native habitats that a revegetation program could achieve. Therefore, the data presented in this study is not exhaustive and does not purport to be. Instead, the data gathered and presented is intended to provide the scope of potential opportunities for revegetation or enhanced revegetation. Funding for further extensive analysis and individual site investigations would be needed to refine the estimate.

Data Collection

State and Tribal Input

OSMRE solicited input from the States through the Interstate Mining Compact Commission (IMCC) to assess the feasibility of a revegetation program at the State level. The IMCC solicited input from its membership and State and Tribal members of the National Association of Abandoned Mine Land Programs (NAAML). OSMRE requested input about the need for a new program, the availability of suitable lands, and the potential for job creation, economic development, and community enhancements. Of the 26 coal mining States and three Tribes contacted by IMCC, 12 provided responses, with at least three from each region. The following summarizes the input received.

Almost all the States that responded said there were available AML sites that could benefit from revegetation, reforestation, or restoration. However, some States indicated that the total number of AML sites was unknown due to limited data in e-AMLIS and State databases. Additionally, some States do not revisit AML sites once successful reclamation of the site has

¹² This is a representation of the upper bound number of bond released sites OSMRE could identify from databases. A detailed investigation would be required to identify the actual number of sites.

¹³ This is a representation of the upper bound number of bond forfeited sites OSMRE could identify from databases. A detailed investigation would be required to identify the actual number of sites.

been completed; therefore, those States are unsure how many previously reclaimed sites could benefit from additional revegetation.

Most States agreed that there are potential Title V reclaimed sites that could benefit from enhanced revegetation. However, some States indicated that it would take additional time to identify those sites and get landowner permission for the enhanced revegetation if needed. Some States noted that differences in native habitats require different revegetation techniques and that reforestation is not always the best option. Responses varied across States about which postmining land uses provide the most significant opportunity for revegetation.

Several States noted that their existing programs focused on revegetation, reforestation, or restoration of reclaimed mined sites. States within the AR discussed their robust activity with OSMRE's ARRI program. Additionally, some States mentioned specific programs operated by State agencies. Other States noted their experiences working with other Federal agencies and NGOs to conduct studies and fund projects related to this topic.

The States generally agreed that a new revegetation program on AML and reclaimed and bond-forfeited Title V mine sites would be beneficial. However, some States felt the effort would be better focused on combating non-native invasive species. Additionally, most States felt there was a need for improvement to e-AMLIS, and some States indicated they are currently developing improved inventory systems.

States can oversee any new program on lands within their SMCRA jurisdiction due to their knowledge of potential sites and the obstacles and challenges of revegetating mined sites. However, States prefer any such program to be voluntary and not an obligation. In light of their competing responsibilities, which are substantially increasing due to the BIL, States expressed the need to have the discretion to prioritize their reclamation-related efforts, including vegetation enhancement opportunities. Furthermore, States want a simple funding mechanism to be used. Some States believe other mined sites, such as sand, gravel, and limestone, should be included as those may also benefit from a revegetation program.

State input was mixed concerning the potential for job creation or the positive economic impact resulting from the program. One State thought there would be a significant economic impact on their coal fields and that jobs could be created for seed growers and a labor force to apply seed, mulch, fertilizer applications, and planting trees. Others noted the various opportunities for job creation and economic development. Half of the respondents believed a program would have little to no economic benefit due to limited labor, contractor, and materials supply competing with other reclamation programs and priorities.

NGO and Public Input

OSMRE solicited input from NGOs and the public to supplement the States' feedback and provide more context on the feasibility of a revegetation program. The following is a summary of the NGOs' responses.

All NGOs agreed that the primary goal of this program should be to use native vegetation to restore habitats on reclaimed mined lands to benefit local wildlife, as some reclamation fails to address restoration holistically. Additionally, some mentioned that for a program to remain successful, it must include long-term monitoring provisions.

All the NGOs mentioned land ownership and differing opinions on postmining land use as a potential barrier to a revegetation program. Almost every NGO that responded agreed that a revegetation program would benefit local and State economies; however, some felt there would be more economic growth than others. The availability of supplies, such as seeds, plantings, and personnel, was a common concern. Some suggested that this program should be established as a long-term program with funding certainty to provide local companies the confidence needed to establish or expand their businesses.

Industry Input

OSMRE communicated with the National Mining Association for an industry perspective on a potential revegetation program to supplement the States' information and provide more context on the feasibility of a revegetation program. The following is a summary of the industry's responses.

Industry representatives noted that broad generalizations or inferences about the vegetation status on sites permitted and reclaimed under SMCRA are not warranted. Instead, industry representatives emphasized that a site-specific analysis is needed to evaluate which reclaimed sites could benefit from enhancement and any underlying issues that might limit the site's revegetation potential. If properly constructed, industry representatives agreed that a program to address Title V and AML sites could be beneficial to enhancing wildlife, recreation, or agriculture. Industry representatives recognized that invasive species, in particular, would need to be evaluated for each project and the cost and ultimate effectiveness of elimination.

Industry representatives identified the availability and sustainability of seeds and plantings, trained entities, and workforce, particularly local workforce, to carry out the work as concerns and potential limiting factors for any economic benefits that a vegetation enhancement program may achieve. They also suggested the consideration of incentives or a streamlined process that would allow operators to more readily correct "nearby" problems. They were also concerned about respecting and navigating the complexities of land ownership, recreational land use, preserving mineral rights, and the ability to obtain landowner permission. Industry representatives saw limited potential for any significant, long-term benefits to local economies arising from this program.

Section 3: Assessment of Technical Capability

OSMRE conducted a literature review of readily available information on vegetation enhancement, revegetation, and associated reclamation of mine sites in the U.S. The literature review was conducted between March 1, 2022, and April 25, 2022, and used the keywords: coal mine, United States, reclamation, and revegetation. OSMRE used this literature review, which consisted of a limited evaluation of studies, articles, and other informational materials, to develop a framework that helped inform OSMRE’s overall recommendations presented later in this report.

Since the implementation of SMCRA, OSMRE has supported reclamation efforts to restore mined lands after mining to approved postmining land uses. Part of this work has included revegetation work and actions such as ARRI.¹⁴

Challenges Associated with the Revegetation of Reclaimed Mine Sites

Reclamation and revegetation of mine sites can be challenging. In general, “[t]he growth and survival of plants depend on a number of environmental factors, such as moisture, nutrients, temperature, and light.”¹⁵ Mining can alter the environmental factors that contribute to plant growth and survival. For example, coal mines in the Western U.S. often face challenges during reclamation because of poor soil composition, arid conditions, and rugged landscapes.¹⁶ These conditions can be compounded due to the nature of mining, which can result in soil damage and the alteration of microbial communities that affect vegetation,¹⁷ even after reclamation.¹⁸

There are other challenges to revegetating AML sites as well. A communication gap between the scientific community and reclamation practitioners hinders the achievement of successful revegetation.¹⁹ Non-native invasive plant species also pose a challenge.²⁰ Schladweiler argued that seed mixes used when SMCRA was first enacted targeted fast coverage and rapid growth, using whatever was commercially available. Newer comprehensive seed mixes

¹⁴ Office of Surface Mining Reclamation and Enforcement. (2022, April 2). Appalachian Regional Reforestation Initiative. <https://www.osmre.gov/programs/arri>

¹⁵ Grunwald et al., 1994. Abandoned mines in Illinois and North Dakota: Toward an understanding of revegetation problems. In: J. Cairns, Jr., ed., *Rehabilitating Damaged Ecosystems*. Boca Raton, FL: CRC Press, pp.40-59.

¹⁶ Haas, K., Nazaryk, P., & DeLay, L. S. (2019). Using emerging technologies to rethink and enhance coal mine reclamation programs in the western united states. *Natural Resources & Environment*, 34(2), 45.

¹⁷ Sheoran, V., Sheoran, A. S., & Poonia, P. (2010) Soil reclamation of abandoned mine land by revegetation: A review. *International Journal of Soil, Sediment and Water*, (3)2.; Swab, R. M., Lorenz, N., Lee, N. R., Culman, S. W., & Dick, R. P. (2020). From the ground up: Prairies on reclaimed mine land—impacts on soil and vegetation. *Land*, 9(11). <https://doi.org/10.3390/land9110455>.

¹⁸ Zipper, C. E., Burger, J. A., McGrath, J. M., Rodrigue, J. A., & Holtzman, G. I. (2011). Forest restoration potentials of coal-mined lands in the eastern United States. *Journal of Environmental Quality*, 40(5), 1567–1577. <https://doi.org/10.2134/jeq2011.0040>.

¹⁹ Clark, L. B., González, E., Henry, A. L., Lave, R., Sayre, N. F., & Sher, A. A. (2019). Successful information exchange between restoration science and practice. *Restoration Ecology*, 27(6), 1241–1250. <https://doi.org/10.1111/rec.12979>.

²⁰ Schladweiler, B. K. (2018). 40 years of the Surface Mining Control and Reclamation Act (SMCRA): what have we learned in the State of Wyoming. *International Journal of Coal Science & Technology*, 5(1), 3–7. <https://doi.org/10.1007/s40789-018-0193-6>.

are available for revegetation, but that does not necessarily mean they are employed at every mine site. As literature has shown, and as identified in other evaluations, non-native and invasive species are still being used to stabilize soils and perform lower-cost reclamation.²¹ Except for a few specific non-native invasive species, SMCRA does not limit plant species used in the reclamation of AML sites. Under Title V, revegetation species are outlined in 30 C.F.R. § 816.111.

Successful Processes of Revegetation

According to another study,²² native species were able to thrive on Title V mine sites as long as proper mitigation of environmental hazards had taken place. Successful revegetation with native or suitable alternatives begins with adequate reclamation of mining features and restoring waterways and soils. Starting with a healthy environment for revegetation will more likely yield better results.²³

ARRI has published 18 *Forest Reclamation Advisories* since 2005.²⁴ These advisories range from establishing the FRA in 2005 to *Managing Invasive Exotic Plant Species on Legacy Mine Lands* in 2019.²⁵ In the latter, the authors provide best practices to successfully eliminate invasive exotic plant species from lands prepared for reforestation. Although best practices from ARRI are intended to be applied to states in the AR, these practices have more comprehensive applications and could be used, where appropriate, in other regions.

Incorporating techniques such as using rough grading, reducing the use of hay mulching, and using appropriate ground cover to lower surface temperatures and trap moisture in the soil, is advisable.²⁶ These techniques are used in Wyoming and demonstrate a clear example of how revegetation can be successful on Title IV and Title V mine sites.

In Indiana, lands cleared of the original deciduous forests for agricultural use and then subsequently mined can still be revegetated into productive habitats for native species.²⁷ Traditionally, seed mixes in Indiana consisted of non-native grasses that provided low-cost revegetation.²⁸ Around the turn of the century, land managers with the Indiana Department of Natural Resources began eliminating non-native herbaceous species in favor of native grassland

²¹ Bauman, J. M., Cochran, C., Chapman, J., & Gilland, K. (2015). Plant community development following restoration treatments on a legacy reclaimed mine site. *Ecological Engineering*, 83, 521–528. <https://doi.org/10.1016/j.ecoleng.2015.06.023>; Swab, R. M., Lorenz, N., Lee, N. R., Culman, S. W., & Dick, R. P. (2020).

²² Zipper, C. E., Burger, J. A., McGrath, J. M., Rodrigue, J. A., & Holtzman, G. I. (2011).

²³ Zipper, C. E., Burger, J. A., McGrath, J. M., Rodrigue, J. A., & Holtzman, G. I. (2011).

²⁴ Office of Surface Mining Reclamation and Enforcement. (2022, April 11). <https://www.osmre.gov/programs/arri/publications>.

²⁵ Office of Surface Mining Reclamation and Enforcement. (2019, February). *Managing invasive exotic plant species on legacy mine lands*. https://www.osmre.gov/sites/default/files/inline-files/FRA-16-Managing_Invasive_Exotic_Plant_Species_on_Legacy_mines-FEB2019_0.pdf.

²⁶ Schladweiler, B. K. (2018).

²⁷ Engbrecht, N., Gallant, A. L., Klaver, R. W., Heemeyer, J. L., Kinney, V. C., & Lannoo, M. J. (2009). Mine spoil prairies expand critical habitats for endangered and threatened amphibian and reptile species. *Diversity*, 1(2), 118–132. <https://doi.org/10.3390/d1020118>.

²⁸ Engbrecht, N., Gallant, A. L., Klaver, R. W., Heemeyer, J. L., Kinney, V. C., & Lannoo, M. J. (2009).

species. These activities provided new habitats for native wildlife, including Henslow's sparrows, bobwhite quail, dickcissels, northern harriers, and short-eared owls.²⁹ For example, a site examined by a set of researchers was initially revegetated using non-native tall fescue; however, in 1999, the Indiana Department of Natural Resources began replacing the tall fescue with native prairie plantings and a mix of native trees and installing water features. The revegetation work established a habitat for native wildlife and provided critical habitat for endangered and threatened amphibian and reptile species.

State, Tribal, and Federal Program Experience and Capabilities

There is a broad range of knowledge and expertise nationwide among OSMRE, States, Tribes, and other Federal agencies that can be applied to implement native revegetation and habitat restoration programs. OSMRE, States, and Tribes are responsible for carrying out the reclamation of AML sites, reclamation of bond forfeited sites, and, in some cases, reclamation of non-coal mine sites. OSMRE has technical staff in each of its three regions that are experts in forestry, ecology, hydrology, biology, and soil science. They are available to provide technical assistance to States and Tribes. OSMRE leverages its capability with the expertise available from its State and Tribal partners to establish a holistic approach for the SMCRA program and stakeholders.

OSMRE solicited information from its staff and other Federal agencies and researched publicly available information, which included information published by State and Tribal AML programs, private restoration companies, and other relevant entities, to evaluate the capability and experience needed to complete revegetation projects in the U.S. The evaluation was divided by geographic regions (Appalachian, Mid-Continent, and Western) as each region has unique vegetation, climate, terrain, and various past mining practices that influence revegetation.

Findings indicate that State and Tribal AML programs and OSMRE have the capacity and expertise to administer and oversee reclamation projects. However, AML reclamation does not always result in restoration to native habitats due to challenges such as funding limitations, differing landowner requests and uses, and poor site conditions. Despite the various problems that could prevent restoration work in the regions, the ability to do so under the right conditions has been demonstrated.

State and Tribal programs often collaborate with networks of experts, including OSMRE staff, other Federal agencies, and researchers. OSMRE strengthens State program relationships with the academic community by entering into technical investigation cooperative agreements with funds from its Applied Science Program. OSMRE, States, and Tribes actively work with local partners who provide them with native restoration techniques tailored to their goals and regional needs. These partnerships allow States and Tribes to expand their understanding of best management practices for revegetating native habitats, allowing them to conduct successful native revegetation reclamation projects.

Thus far, OSMRE has funded 14 different mine land reforestation technical investigations through its Applied Science Program. The results of this research are incorporated

²⁹ Engbrecht, N., Gallant, A. L., Klaver, R. W., Heemeyer, J. L., Kinney, V. C., & Lannoo, M. J. (2009).

into most of the revegetation, reforestation, and restoration projects undertaken by ARRI and partners.³⁰

Appalachian Region (Interior Regions 1 and 2)

The Appalachian regional office is located in Pittsburgh, Pennsylvania, and has three field offices: Pittsburgh; Charleston, West Virginia; and Lexington, Kentucky. The AR has technical support staff consisting of hydrologists, biologists, ecologists, engineers, and foresters. The conditions in the AR are not as variable as the other OSMRE regions, with most of the native habitat being forest.

The States within the AR employ best management practices and provide the expertise that can be applied when restoring native habitats on AML sites. The AR has many AML sites, and State AML programs receive substantial funding from OSMRE. The region has dedicated funds and personnel to investigate best practices for reclaiming AML sites. States work collaboratively with OSMRE, other Federal agencies, universities, NGOs, and other entities to conduct this work.

One practice often used in the AR to revegetate active and AML sites is the FRA developed by ARRI. OSMRE formed ARRI in 2004 to improve reforestation success on mine sites nationwide. ARRI's mission is to plant more high-value native trees, increase planted trees' survival and growth rate, and expedite the establishment of forest habitats through natural succession on mine sites. Although this is a nationwide program, ARRI conducts most of its work within the AR.³¹

ARRI is a coalition of groups and consists of a core team, a science team, and many partner organizations.³² ARRI advocates using a set of best management practices known as the FRA to plant trees on mine sites. The FRA is a five-step method that creates a suitable growth medium and emphasizes planting native trees and shrubs using proper techniques. These techniques are based on research from universities and the science team.

ARRI works on three categories of mine sites: active mining operations, AML projects, and bond released or forfeited sites. For each category, the core team promotes the FRA early in the process. The core team also provides training and technical assistance and often collaborates with the science team to provide on-site visits. The core team works with for-profit and non-profit organizations, fiduciary partners, landowners, and other partners to locate, prioritize, revegetate, restore, and monitor previously reclaimed mined lands. On bond released or forfeited sites, ARRI partners with GFW. GFW, established by the ARRI science team, helps find, coordinate, and fund the reforestation and restoration of older reclaimed mine sites.

³⁰ For a list of the mine land reforestation research funded through OSMRE's Applied Science Program, please visit <https://www.osmre.gov/programs/arri/publications>.

³¹ ARRI's primary partners are the State regulatory authorities and AML programs in the AR, including Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. Partners often go beyond regulatory authorities and include the coal industry, environmental organizations, academia, government agencies, and citizens.

³² For a list of Core Team members and Science Team members, please visit ARRI's website at: <https://www.osmre.gov/programs/arri>.

Before the FRA, most mine sites within the AR were reclaimed to support alternative land uses such as hayland, pastureland, undeveloped habitat, and wildlife habitat as opposed to the pre-mining land condition of forestland. A recent study by the University of Kentucky estimated that over 1.5 million acres of coal-mined lands in Appalachia alone have been converted from forestland to grassland or scrub and shrub cover types dominated by non-native invasive species.³³ With the advent of FRA, more of these sites are now being reclaimed to forestland. Highly productive forests can be created on reclaimed mine lands using the FRA under existing laws and regulations. Reestablishing native cover types maximizes ecological services, including carbon sequestration and storage, helps to maintain biological diversity, creates habitat for species of concern, filters the air and water, provides recreation opportunities, and provides economic opportunities for the landowner through potential forest products, such as pulpwood, timber, and non-consumptive uses. The local economy is boosted through reclamation, revegetation, reforestation, restoration work, and any future development of commercial forest resources. The FRA is accepted as the best technology currently available for mine land reforestation.

Mid-Continent Region (Interior Regions 3, 4, and 6)

There are three field offices in the MCR. The offices are located in: Birmingham, Alabama; Tulsa, Oklahoma; and Alton, Illinois. Alton is also the home of the Mid-Continent Regional Office. Like the AR, the MCR has technical support staff consisting of hydrologists, biologists, soil scientists, and engineers. The MCR has highly variable conditions, with different vegetation types, land uses, and unique issues. Staff routinely work with States and Tribes to ensure successful revegetation.

In terms of expertise, resources are often available from other Federal agencies and academia. For instance, State regulatory authority programs often collaborate with major universities in their States. Indiana has worked with a forestry professor from Purdue University, and the Mississippi program staff have worked with a soil scientist and a forester from Mississippi State University. Another example is an MCR soil scientist who has collaborated with a research forester from Louisiana State University. This relationship between OSMRE, the State SMCRA programs, and the academic community is strengthened by research grants provided through OSMRE's Applied Science Program. In addition, several Natural Resource Conservation Service (NRCS) staff have often worked with States on revegetation issues and remain a resource for State SMCRA programs. Furthermore, the MCR often communicates with NRCS when questions or problems, arise given NRCS' familiarity with local conditions.

States in the MCR conduct native vegetation restoration projects to restore native habitats throughout the region. Many States, such as Iowa, are working to establish native monarch butterfly habitats on AML sites. The Iowa AML Program often seeks out and collaborates with local partners, such as the Iowa Monarch Consortium, Iowa State University, and OSMRE, to improve its projects and achieve its goals. Another example of revegetation work to restore native habitats is planting warm-season grasses. The Missouri AML Program plants native warm-season grasses at its project sites and guides landowners to help them understand the

³³ Lee, B. D., Wilson, C. L., and Barton, C. D. (December, 2011). *Reforestation Opportunity Areas in the Central and Northern Appalachian Coal Basins*.

unique management requirements of native grass species on mined land. The Missouri AML Program received grant money from the National Fish and Wildlife Foundation's Monarch Butterfly Conservation Fund. In spring 2018, the Missouri AML Program planted native warm-season grasses and forbs on about 100 acres to provide favorable habitat conditions. While the MCR has experienced successful projects, it is important to note some documented failures. For instance, in Alabama, native species planted at the request of the USFS did not survive the harsh conditions of the AML site, highlighting the importance of understanding the unique management requirements for native species on mined lands.

A key aspect of expertise is knowing where to get information. The NRCS and the USFS provide readily available information about plants, including species range, uses, and suitable growth medium conditions. The U.S. Environmental Protection Agency has delineated ecoregions of North America, which are areas of general similarity in ecosystems, and the type, quality, and quantity of environmental resources.³⁴ Valuable information concerning ecoregions can be used to determine native habitat and environmental conditions such as geology, soils, vegetation, and climate.

The limiting factor in planting native species and restoring habitat is not expertise. Poor site physical and chemical characteristics are the key determinants. In many cases, AMD and water quality are the most critical issues. Cost is another significant factor, as are erosion control and landowner requests. Despite various challenges preventing restoration work in the MCR, the ability to do so under the right conditions has been demonstrated. The State programs that will complete the bulk of the restoration work have a network of experts to rely on, including OSMRE staff, other Federal agencies, and university researchers.

Western Region (Interior Regions 5 and 7-11)

The WR has field offices in Lakewood, Colorado, and Casper, Wyoming. The regional office is located in Lakewood, Colorado. Throughout the WR, OSMRE administers and oversees reclamation projects helping to restore the function of native ecosystems. The New Mexico AML Program has managed several stream restoration projects.

In the West, OSMRE and Federal land management agencies often encounter projects within the sagebrush steppe, a native habitat covering 165 million acres across 11 states. OSMRE has partnered with the BLM-Wyoming AML Program and the Wyoming Department of Environmental Quality – AML Division to create the AML Native Plants Project. Originally designed to improve sage grouse habitat, the group's mission statement is now to enhance habitat for sagebrush-obligate species at previously reclaimed mine sites that lack a healthy sagebrush component. This group has created a sustainable network that includes seed sourcing and preparation, greenhouse construction and management, planting, public outreach, and the ability to expand and grow in scale as restoration work accelerates.

³⁴ U.S. EPA. (2015, November 25). *Level III and IV Ecoregions by State*. Retrieved from <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-state>.

The group is now expanding into producing more native species and has two field sites: the Gas Hills Uranium Mining District (Red Star) in central Wyoming and the Shirley Basin Uranium Mining District (Black Star) in east-central Wyoming. The AML Native Plants Project also partners with the Sagebrush in Prisons Project, which provides unique and meaningful ecological activities and training to incarcerated people to restore native habitat for the greater sage-grouse in the Great Basin region. The project is currently active in nine prisons in five states. Crew members in the prisons grow sagebrush from seed and water, weed, thin, and fertilize the seedlings throughout the spring and summer. In the fall, the sagebrush seedlings are sent to BLM restoration sites for planting. The AML Native Plants Project is also part of the BLM's Native Plant Materials Development Program, created in 2001 to develop high-quality seeds and seedlings of America's native plant species for restoration, rehabilitation, and reclamation. Ecoregional programs have been established to prioritize, research, and guide the development of restoration seeds needed within each ecoregion.

The USFS also runs a Western Center for Native Plant Conservation and Restoration Science program, whose mission is to address and provide science-based solutions to ongoing challenges in the conservation and restoration of Western ecosystems. Areas of interest include impacts from the increased occurrence of wildland fires, invasive species, climate change, and the decline of pollinators. Participating scientists include research plant physiologists, geneticists, ecologists, botanists, and entomologists. Their expertise spans the entire conservation and restoration process, from plant species selection to identifying appropriate genetic resources for plant propagation and landscape deployment. The goals of this Center are to:

- Deliver state-of-the-art science to land managers focused on plant physiology, seed ecology, plant genetics, rare plant conservation, plant-pollinator relationships, monitoring, and small to large-scale land restoration with native plants across diverse landscapes of the West;
- Help the USFS address the needs of the American public by supplying, in a cost-effective manner, scientific information to meet the goals of national restoration strategies; and
- Become the “go-to” organization for those seeking to sponsor research and science applications that target native plant conservation, restoration, and reforestation.

The Western Center for Native Plant Conservation and Restoration Science (Center) enhances opportunities for sharing equipment and resources; improved access to databases, study areas, or cooperator services; compatibility in science goals and direction; better synergistic thinking and networking opportunities; and comprehensive spatial and temporal studies. The Center collaborates with many stakeholders (such as Federal, State, Tribal, and private organizations that work on native plant conservation, restoration, and ecosystem resiliency). This collaboration builds on a long legacy of management partnerships with Federal and State agencies, seed and seedling producers, and universities, including the Great Basin Native Plant Project; the National Center for Reforestation, Nurseries, and Genetic Resources; and the Seedlot Selection Tool Project.

Section 4: Applicability of Existing Programs to a New Revegetation of Reclaimed Mine Sites Program

OSMRE evaluated the applicability of its programs that address Title IV and Title V sites. In addition, OSMRE also evaluated GFW, an external group that works with OSMRE. The evaluation of these programs sought to identify efficient pathways or components of existing programs for use in any new revegetation program.

Abandoned Mine Land Economic Revitalization (AMLER) Program

Congress has appropriated funding each fiscal year beginning in 2016 for the AMLER Program (formerly known as the AML Pilot Program), which is intended to accelerate the remediation of AML sites with economic and community development end uses in mind. Currently, the AMLER Program provides grants to the six Appalachian States with the largest unfunded needs for the reclamation of Priority 1 and Priority 2 sites as listed in e-AMLIS. The AMLER program also provides grants to the three Tribes with approved AML reclamation programs. The AMLER Program supports local investment opportunities for sustainable long-term revitalization of coalfield economies. OSMRE administers the AMLER Program and provides eligible States and Tribes with AMLER grants and guidance on project eligibility criteria and reporting requirements. Unlike fee-based AML grants, AMLER grants may be used for economic and community revitalization activities in addition to reclamation activities.

While current AMLER funds could be expended on the revegetation of reclaimed sites under certain circumstances, States and Tribes have traditionally selected projects with a higher potential for economic and community revitalization, such as developing industrial sites or extending recreational trails to increase tourism. Thus the AMLER program, is unlikely to contribute significantly to the revegetation of reclaimed mine lands. However, as a program that provides grants to States and Tribes for a purpose complementary to that traditionally served by the fee-based AML program, the AMLER program may serve as a suitable model for a new revegetation program. For example, a new revegetation program could address economic and community development end-use goals in conjunction with revegetation needs and opportunities.

Watershed Cooperative Agreement Program (WCAP)

In 1999, Congress authorized the WCAP, which provides supplemental financial assistance to non-profit watershed restoration groups and other non-profit organizations for the construction of AMD treatment facilities that help restore the biological health of local streams. As WCAP funds are available, OSMRE announces a Notice of Funding Opportunity, and applicants apply to OSMRE for a cooperative agreement. The amount of each cooperative agreement awarded usually is less than \$100,000. To qualify for WCAP funding, an applicant must identify other partners willing to contribute financially to the project or provide in-kind services. OSMRE's subject matter experts vet and rank the applications, and cooperative agreements are awarded based on the amount of program funding available. The projects eligible for funding under this program are limited to sites that were abandoned before 1977.

The WCAP provides a suitable model for OSMRE to transfer funds to NGOs and could provide a model for a revegetation program. A WCAP-type component would be able to help leverage additional resources for revegetation projects; fund projects in states that choose not to participate in a revegetation program; or help revegetate sites NGOs have prioritized. In addition to funding cooperative agreements, projects could be solicited and reviewed using the same process as in the WCAP, and applicants could be required to identify partners willing to contribute financially to the project or provide in-kind services, leveraging nonfederal funds to increase revegetation.

Appalachian Regional Reforestation Initiative (ARRI)

ARRI is an OSMRE initiative that improves reforestation success on mine sites by promoting the use of FRA. It is practiced chiefly in the Eastern U.S. but can be applied to reforestation efforts nationwide. No direct appropriations are provided for ARRI. OSMRE currently uses annual appropriations to support two full-time employees coordinating and implementing this initiative in addition to their other responsibilities³⁵.

ARRI's primary partners are the State regulatory authorities and State AML programs in the East, including Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. Partners also go beyond mining and reclamation regulators and include the coal industry, environmental organizations, academia, other government agencies, and citizens dedicated to restoring forests on coal-mined lands.

The processes and guidance employed in the ARRI program could also be included in the design of any revegetation program, and the ARRI partnership could be a model for OSMRE cooperating with partners on the revegetation of reclaimed mine sites.

Green Forests Work (GFW)

GFW is a 501(c)(3) non-profit tree planting organization that was established by the ARRI science team in 2009. GFW's mission is to "restore healthy and productive forests on coal-mined lands in Appalachia and beyond." GFW restores ecological value through reforestation, watershed enhancements, and recreational development for environmental, financial, societal, and community benefits. GFW primarily works on older, reclaimed mine and bond forfeiture sites and helps fund tree planting on AML sites throughout the Appalachian Coal Basin.

GFW is funded through grants and donations. GFW does not receive direct federal appropriations, and OSMRE does not provide it with federal financial assistance. GFW usually has two to three full-time employees and two to three part-time employees. The number of employees varies depending on funding, which is mainly in the form of grants. GFW has used Federal grants from the NRCS and the USFS. The National Fish and Wildlife Foundation also provides funding opportunities, usually annually. GFW also accepts corporate and private

³⁵ Additional information related to the ARRI program is available in this report on page 21 and at www.osmre.gov/arri.

donations. Leveraging donations of money, tree seedlings and other materials, work and services, and in-kind partner contributions help the reforestation effort on reclaimed mined sites.

The processes and guidance employed in the GFW program could be included in the design of any program. The partnership between GFW and OSMRE could be a model for OSMRE cooperating with similar partners on the revegetation of reclaimed mine sites.

Applied Science Program

OSMRE's Applied Science Program provides funding through cooperative agreements with academic and research institutions. These awards enable the development and improvement of technologies that address public safety and environmental issues related to coal mining and reclamation. Funds, which OSMRE designates from the existing budget on an annual basis, are made available to applicants who submit proposed projects. These proposals are reviewed jointly by OSMRE and State teams, and a ranked list is provided to OSMRE senior management, who decide which projects will be funded and the amount of funding. Although applied science funding cannot be used for revegetation purposes, the program provides OSMRE with the necessary experience to operate and manage a competitive award process.

Title IV AML Fee-Based Funding

Traditional reclamation fee-based grant funds must be used to address the reclamation of AML sites according to the priorities established in Title IV of SMCRA. These funds cannot be used for mine sites permitted under Title V of SMCRA. Given the large inventory of AML sites remaining, including water resources in need of reclamation, and Title IV's focus on abating and reclaiming AML hazards, additional funds and authorization would be required before uncertified States could expend money on a revegetation program. Currently, certified States and Tribes—those AML program States and Tribes that have certified to OSMRE that all their known coal reclamation priorities have been completed—could choose to use their traditional fee-based funds on the revegetation of reclaimed sites; however, other than addressing any coal reclamation needs as they occur, those funds do not prioritize revegetation projects. As a result, certified States and Tribes may consider revegetation projects to be a lower priority than other allowable projects. Therefore, to provide a dedicated funding source for revegetation, Congress could amend Title IV to require certified States and Tribes to prioritize revegetation work.

Bipartisan Infrastructure Law AML Funding

The BIL appropriated \$10.873 billion for annual grants to States and Tribes for AML and water reclamation projects under SMCRA. BIL AML program funds may only be used for P1, P2, or P3 projects, water supply restoration projects, or emergency projects. However, the BIL does not expand OSMRE's authority to reclaim non-AML sites. Instead, the BIL provides additional funds for the reclamation of AML sites. Consequently, BIL AML funds could be used to revegetate an AML site that is being reclaimed with BIL funds, but BIL AML funds would not be available to revegetate previously reclaimed AML mine sites or sites that were permitted under Title V of SMCRA.

Federal Reclamation Program

OSMRE operates a Federal Reclamation Program in States and on Indian lands without a State or Tribal AML Program. Under this program, OSMRE directly administers all aspects of any reclamation project, including evaluation of the site, addressing NEPA requirements, contracting for work to be performed, and monitoring of construction. Projects are either high-priority or emergency projects, and funds are requested when problems are identified. Emergencies are funded immediately, and high-priority projects typically receive funding for the following fiscal year. The Federal Reclamation Program could be a model for revegetation and enhancement projects in States or on Indian lands without State or Tribal AML Programs, which are not covered under other programs described herein.

Title V Regulatory Program Funding

Title V funds are used to administer and oversee state Title V programs and to provide technical assistance in the furtherance of these programs. As currently written, neither section 705 of SMCRA, which authorizes Title V regulatory grants to State regulatory authorities, nor funds appropriated directly to OSMRE for administration of Title V on States and on Indian lands without primacy, would cover a revegetation program. Specific Congressional authorization and appropriations would be necessary to provide funds under Title V for a revegetation program covering reclaimed bond released or bond forfeited sites.

Civil Penalty Reclamation Projects

The Director of OSMRE is authorized to use their discretion to award Federal civil penalty funds, collected under section 518 of SMCRA, to identify and fund reclamation projects on abandoned sites or where a bond forfeiture exists after implementation of SMCRA. The use of Federal civil penalties for reclamation is limited because each project must be entirely financed by civil penalty funds. Given this limitation, these funds are typically used to address exigent circumstances. A State can apply for civil penalty funds when the OSMRE Regional Director notifies it that funds are available.

Bipartisan Infrastructure Law Ecosystem Restoration

Section 40804(b)(8) of the BIL provides \$200 million for restoring native vegetation and mitigating environmental hazards on Federal and non-Federal mined land, with \$100 million available to the Secretary of the Interior and \$100 million available to the Secretary of Agriculture. While OSMRE does not administer this program, these funds could help advance the objectives of an OSMRE revegetation program.

Section 5: Feasibility of a New Program

The feasibility study findings indicate that sites exist that could benefit from a revegetation and vegetation enhancement program for reclaimed mined sites. OSMRE has adequate technical and administrative expertise to implement such a program.

Structure

The most comprehensive program would include Title IV and Title V sites, and capitalize on the strength, expertise, and capacity of OSMRE, the State and Tribal programs, NGOs, and other organizations. Funding could be appropriated to OSMRE for revegetation and vegetation enhancement; OSMRE could then pass a large percentage of the funds through to States and Tribes with approved AML or regulatory programs. Given the States' and Tribes' existing reclamation responsibilities, the program could be structured to allow all State and Tribal programs (Title IV and Title V) to apply for available funding. Similar to the WCAP, a percentage of the funds provided to OSMRE could be made available to NGOs or other qualifying entities. Finally, OSMRE could directly perform revegetation work on Title IV and Title V sites under its jurisdiction, including States and Indian lands covered by the Federal Reclamation Program and Federal Title V programs (e.g., Federal Indian lands programs and Federal programs). Any revegetation program should adopt the practices of ARRI, where applicable, which have proven to be successful.

Given varying levels of interest and capacity by States and Tribes, funding and administration of qualifying State and Tribal projects could be carried out using processes and guidelines similar to the AMLER Program. Application, review, selection, funding, and management of NGO or other qualifying entity projects could be carried out using competitive processes and guidelines similar to those established by the WCAP, but tailored towards the revegetation of reclaimed mine lands. Likewise, a Federal revegetation program could work within its existing Federal Reclamation and Federal Title V programs.

Under this structure, each participating State or Tribe would be able to prioritize and select sites for revegetation or enhanced reclamation or revegetation according to outlined criteria and would manage projects subject to OSMRE oversight. Eligible work would be limited to revegetation activities at Title IV (P1, P2, and P3) sites and Title V reclaimed and bond forfeiture sites, including those on Federal, Indian, State, and private lands. Participating States and Tribes should be required report on the status of projects and overall program performance through annual reporting. After completion, NGOs or other qualifying entities should be required to provide project reports to OSMRE and the relevant States and Tribes. OSMRE would provide updates on work performed by the Federal Reclamation Program and Federal Title V programs in its regular reporting to Congress.

Funding

Any new program would require new programmatic funding as well as funding for OSMRE to administer the program. Any new program should be phased in to allow OSMRE time to develop the program and give States, Tribes, and other entities time to prepare to

administer the program, such as hiring full-time equivalents (FTE) to manage it. The program's first year funding could be primarily dedicated to the development of the program, whereas funding for subsequent years could focus primarily on projects while continuing to support any additional FTEs authorized under the program.

Implementation

OSMRE could implement a program through its existing financial assistance and Federal Reclamation and Title V programs in a two-pronged approach. One prong could create an analog to the existing AMLER grant program that details the eligibility and use of the funds and relies on OSMRE's existing processes and future guidance for projects to be administered directly by States and Tribes. The second prong could create a program similar to the existing WCAP that details project eligibility and use of the funds and relies on OSMRE's existing processes for developing and selecting cooperative agreements and future guidance for projects to be conducted by NGOs and other qualifying entities. Leveraging in-kind services or matching funding, particularly in the financial assistance provided to NGOs and other qualifying entities, could enhance the program's impact. Applicants could be encouraged to include a volunteer component to increase outreach and awareness of the program.

Because these projects would be entirely or primarily funded using Federal funds, other applicable Federal statutes and regulations such as NEPA would likely apply. OSMRE anticipates that funding recipients would comply with these laws and regulations as they do under the existing programs.

As noted above, any new program should be phased-in so that in the first year OSMRE can work with States, Tribes, NGOs, and other entities to develop program guidance and implementation instructions cooperatively, with the opportunity to fund pilot projects. After the first year, OSMRE would refine its program guidelines and procedures based on lessons learned from the pilot projects. OSMRE believes this phase-in approach results in more effective programs.

Monitoring

OSMRE would manage any new program the way it manages and oversees other financial assistance programs, such as AMLER and WCAP, which the States, Tribes, and NGOs currently operate with OSMRE oversight. Progress, status, and the degree of project success are required to be reported in annual reports. In addition, States, Tribes, and cooperative agreement recipients are required to provide reports one year and five years after project completion. Likewise, pursuant to section 706 of SMCRA, OSMRE includes updates about Federal projects in its budget requests and reports to Congress. These reports provide an ongoing evaluation of OSMRE programs.

Potential Barriers

The BIL identified sections 401, 405, and 408 of SMCRA as potential barriers that could limit the use of existing funds and OSMRE's authority. OSMRE reviewed these sections to determine if potential barriers exist:

Section 401

All moneys deposited in the Abandoned Mine Reclamation Fund are subject to the use restrictions set out in section 401(c) of SMCRA, unless otherwise authorized by Congress. As such, projects funded from moneys within the Abandoned Mine Reclamation Fund, including BIL AML funds, can generally only be used for Title IV work and other purposes listed in section 401, which is focused primarily on mitigating hazards on sites abandoned or left in an inadequate reclamation status before 1977. Thus, without specific authorization, moneys from the Abandoned Mine Reclamation Fund could not be used for the revegetation of mine sites permitted under Title V of SMCRA or for revegetation on AML sites beyond that necessary for mitigation of the specific AML hazard as provided in Title IV of SMCRA. Title IV programs would need specific authority to perform revegetation on non-AML sites for any work funneled through their programs.

Section 405

This section of SMCRA requires the Secretary to promulgate regulations covering the implementation of an AML reclamation program incorporating the provisions of Title IV and establishing procedures and requirements for preparation, submission, and approval of State and Tribal AML programs consisting of the plan and annual submissions of projects. If an AML Program uses additional funds from the revegetation program, it may need to update its State or Tribal Reclamation Plan.

Section 408

This section of SMCRA provides authority for the Secretary of the Interior and State and Tribal AML programs to file liens on private property covering increased property values resulting from reclamation performed under Title IV. It is unclear whether this provision would also extend to revegetation or vegetation enhancement because this program will likely cause property values to increase. To improve participation in a revegetation program, especially amongst landowners, providing an exemption from this section for this program might be beneficial.

A similar barrier may also exist under the Office of Management and Budget's Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200. For example, 2 C.F.R. § 200.311 requires non-Federal entities to obtain disposition instructions from the Federal awarding agency or pass-through entity when real property acquired or improved with Federal funds is no longer needed for its originally authorized purpose. The disposition instructions provided to the non-Federal entity must include one of the following alternatives: (1) retain title after compensating the Federal awarding

agency³⁶; (2) sell the property and compensate the Federal awarding agency³⁷; or (3) transfer title to the Federal awarding agency or to a third party designated/approved by the Federal awarding agency³⁸. The requirement that the Federal awarding agency must be repaid its percentage of participation in the purchase price and/or the cost of any improvements might deter some recipients, subrecipients, or landowners from participating.

OSMRE's Capacity and Capability to Start a New Program

As discussed in the implementation section, in developing a new program, a phase-in period would reduce the administrative barriers associated with program development and give OSMRE time to build the required staff and infrastructure before the program is fully funded. Any new program would also require additional funding to support staffing increases at the State, Tribal, and Federal levels and would need to provide OSMRE with sufficient statutory authorization.

Incomplete Inventory and Data Limitations

As was discovered during the feasibility study, the current datasets held by OSMRE, States, and Tribes do not contain complete and consistent data that can readily identify specific sites that could benefit from a revegetation program.

Lack of Public Understanding

Some members of the public and some landowners may not understand the need for the surface disturbances associated with revegetation or enhanced vegetation or why land that has existing vegetation should be altered from its current state to what they may perceive as a less mature environment. Similar problems exist with reforestation. The public and landowners may not necessarily understand the difference between existing conditions, what the site could look like, and its productivity if it were revegetated with healthy native vegetation.

Landowners Unwilling to Participate

Most sites that could benefit from this program are on private property. The decision to revegetate these sites would need to include the entity responsible for the revegetation (e.g., OSMRE, the State or Tribe, NGO) and the landowner, who would need to provide consent. The

³⁶ If the Federal awarding agency or pass-through entity instructs the non-Federal entity to comply with the first disposition alternative, the amount paid to the Federal awarding agency is calculated by “applying the Federal awarding agency's percentage of participation in the cost of the original purchase (and costs of any improvements) to the fair market value of the property.” 2 C.F.R. § 200.311(c)(1).

³⁷ If the Federal awarding agency or pass-through entity instructs the non-Federal entity to comply with the second disposition alternative, the amount due to the Federal awarding agency is calculated by “applying the Federal awarding agency's percentage of participation in the cost of the original purchase (and cost of any improvements) to the proceeds of the sale after deduction of any actual and reasonable selling and fixing-up expenses.” 2 C.F.R. § 200.311(c)(2).

³⁸ If the Federal awarding agency or pass-through entity instructs the non-Federal entity to comply with the third disposition alternative, the non-Federal entity is entitled to be paid an amount calculated by applying the non-Federal entity's percentage of participation in the purchase of the real property (and cost of any improvements) to the current fair market value of the property. 2 C.F.R. § 200.311(c)(3).

landowner's decision may be heavily influenced by the possibility of a lien or other financial or legal liabilities that may attach to the property.

State and Tribal Participation

Similar to OSMRE, States and Tribes have limited staffing, and a new program may burden their resources because it would require additional planning, oversight, and reporting. This barrier could be reduced by allowing States and Tribes to use program funds to hire appropriate staff and providing adequate phase-in time to implement the program.

Different Priorities Among States, Tribes, NGOs, and OSMRE

Site conditions across the U.S. vary along with the number and location of potential sites. There may be disagreement among stakeholders about which sites should be prioritized for revegetation and how projects should be coordinated with planned or ongoing AML or bond forfeiture work. If a State or Tribe opts not to participate in any new program in any given year, the funding that would have been available to that State or Tribe could be made available to NGOs or other qualifying entities. This approach would allow new and existing NGOs to increase involvement in environmental restoration within coalfield communities.

Resources

In addition to funding, other resources, such as contractors, plant materials, soil amendments, and staffing, are limited. These resource limitations pose a considerable barrier to implementing any new program, especially at the beginning when, for example, the supply of plant materials may not meet demand.

Benefits of a New Revegetation Program

In addition to the environmental benefits inherent to a successfully vegetated site, i.e., increased native habitat, biodiversity, carbon sequestration and storage, improved water quality, and moderation of surface water runoff and reduction of downstream flooding, other economic and community benefits would be achieved by a revegetation program. These include:

Employment Opportunities

Mine land revegetation would provide employment opportunities for equipment operators (often displaced miners), seed collectors, nursery workers, professional tree planters, and the service sector. Future employment opportunities exist for land managers, timber operators, truckers, sawmill workers, and other occupations.

Increased Land Value

Establishing high-quality native habitat provides value through future timber sales, grazing, and recreational opportunities.

Environmental Assets/Credits

By agreeing not to develop the land and to keep it in a natural condition, a landowner may be able to generate revenue by, for example, selling a conservation easement or credits, such as carbon credits. Carbon markets are developing, and aggregators of carbon credits are gaining interest in mine land restoration. ~~h~~

Other Sources of Potential Revenue

Landowners also would have the potential to generate revenue by leasing land for hunting or selling native vegetation products. Leasing land for hunting to individuals or hunt clubs is becoming common. The harvesting or foraging of fruits, nuts, roots, fungi, and other plants can be a source of revenue and can be sustainable. These products are becoming common in local farmers' markets.

Improved Hunting Opportunities

Forestland plantings can be used to improve wildlife habitats for various species. Native species are always planted while meeting the landowner's objectives. Landowners usually provide input on tree and shrub species selection. Often private landowners allow locals to hunt on their property. When public land is restored, hunting is almost always allowed.

Other Recreational Opportunities

Many revegetation projects have a recreational component, such as multipurpose trails and camp sites. Improved access allows landowners better opportunities to enjoy their property. Revegetation projects on public lands provide recreational opportunities for all. Ecotourism, including wildlife viewing, is becoming more common on these restored mined lands.

Developing Projects in Hard Hit Coalfield and Power Plant Communities

Most of the mine land reforestation/restoration projects occur in coalfield communities, which have been significantly impacted by coal mine and power plant closures. Engaging and/or employing local citizens and displaced workers can ease the transition from coal production and combustion to a more diverse economy. Emphasizing nature and recreation makes a community more attractive to future businesses and improves public health and well-being.

Opportunities for Youth, STEM, and Diversity Related Engagements

Funding opportunities could be available for youth, STEM programs, or entities promoting diversity (e.g., Historically Black Colleges and Universities) to undertake revegetation projects. Opportunities exist for student involvement in seed collection, propagation, nursery work, site preparation, planting, and monitoring.

Giving Back

Revegetation projects allow landowners, coal operators, miners, and citizens who have benefited from mining an opportunity to give back to the community.

Conclusion

OSMRE has concluded that, in partnership with States, Tribes, and NGOs, implementing a program to revegetate reclaimed mine sites is technically and administratively feasible. OSMRE identified sites potentially suitable for revegetation and a revegetation program could produce environmental, economic, and community benefits. Program benefits would include the restoration of native habitats, the creation of employment opportunities related to revegetation work, and the potential development of outdoor recreational opportunities on revegetated mine sites.