

# CREATING PARTNERSHIPS TO ENHANCE WATERSHEDS BY ELIMINATING SMALL ACID MINE DRAINAGE USING WATERSHED COOPERATIVE AGREEMENT PROGRAM FUNDS<sup>1</sup>

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**Abstract.** Through the creation of partnerships with federal, state and local governments, and numerous civic groups and Resource Conservation and Development agencies, localized acid mine drainage in watersheds is being ameliorated and removed through the complete reclamation of the abandoned coal mine sites.

One of the successful programs dealing with AMD concerns on watersheds is the Watershed Cooperative Agreement Program (WCAP). The Office of Surface Mining and Reclamation and Enforcement (OSM) initiated this program in 1999.

This paper will discuss the various initiatives that OSM has used to date in an effort to ameliorate some AMD concerns from past coal mining activities. The most current initiatives are the use of the WCAP grant funding and the new option given states receiving OSM abandoned mine land (AML) grants to increase the dollar amount the state can set aside from that grant to address current and future AMD concerns. This discussion will include the application and success of dealing with AMD through the WCAP grant process in the State of Iowa which is part of the OSM Mid-Continent Region. Complete reclamation of the abandoned coal mine sites has been and is being used to treat and eliminate the AMD which has been affecting the land, water, vegetation and aquatic life in streams within the watershed area. Passive AMD treatments were reviewed on a few of the projects, but determined not to be appropriate for the proposed long range success of the project and will not be discussed. The paper will also discuss the role of the various partners in funding the reclamation of the AMD projects.

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## **INTRODUCTION**

Through the creation of partnerships with Resource Conservation and Development (RC&D) organizations, numerous civic groups, federal, state and local government agencies, industry and many other stakeholders, localized acid mine drainage (AMD) affecting watersheds is being ameliorated and removed through the complete reclamation of an abandoned coal mine site.

An RC&D is a not for profit organization that provides local leadership and framework for local watershed project development, natural resource conservation, economic development, recreation projects and many other programs to strengthen the environment of the community.

The coordinator of the RC&D works with the state's abandoned mine land personnel and OSM. The three parties work as a team in seeking out and developing partnerships with all stakeholders and interested parties who have goals of enhancing the environment of their communities.

Once the abandoned mine land (AML)/ AMD sites are selected, reclamation contracts are let. The sites with acidic ponds are completely reclaimed through treatment with NaOH and are removed or restored. Acidic spoil piles are graded, treated with a pre-determined tonnage of lime, buried and covered with an appropriate depth of suitable soil material. An additional amount of agricultural lime is then incorporated into the soil. Following the removal of the water and air to the acidic material, the area is vegetated and mulched. This accomplished the complete reclamation of the abandoned coal mine site removing, the AMD concern.

In the State of Iowa, numerous abandoned mine land acid mine drainage sites have degraded the local streams and rivers from past coal mining activities. The toxic runoff has affected the local watersheds, water supplies, aquatic and vegetation viability, recreation and other environmental concerns. Unique partnerships with the RC&D's and with many different stakeholders have been developed to ameliorate and/or completely reclaim local acid mine drainage (AMD) concerns in various communities.

### **Acid Mine Drainage Concerns**

Acid mine drainage is considered one of coal mining's most serious threats to water resources, aquatic life, vegetation, and the surrounding environment which it affects. This acidic

drainage from abandoned coal mining has been and is currently having a devastating impact on streams, rivers, vegetation and aquatic life in many states in our nation. The acidity of coal-mine drainage is caused primarily by the exposure to air and water of the mineral pyrite which is in the coal. This oxidation of the mineral pyrite is found in coal, coal overburden, and mine waste piles. The rate of pyrite oxidation depends on numerous factors including the reactive surface area of the pyrite, the oxygen concentration and pH of the water, the forms of pyrite, and the presence of Fe-oxidizing bacteria (OSM, 2008a & OSM.2007).

Thousands of miles of streams and adjacent land acres are affected throughout the coal mine areas in the United States, but mainly in the eastern portions of the U.S. Both surface and underground water become contaminated due to this AMD (Skousen, 1997 & OSM, 2007).

In 2003, the U.S. Environmental Protection Agency (EPA) singled out drainage from abandoned coal mines as the number one water quality problem in the Appalachian Region, especially in Pennsylvania and West Virginia. It has been estimated that 90% of the pollution problem originates with abandoned underground mining operations, with 10% of the AMD coming from old surface mines and their spoil piles (OSM.2006).

The United States Geological Society (USGS) has noted that government, industry and educational institutions have conducted a significant amount of scientific research to determine the chemical reactions that create acidity and lead to the precipitation of dissolved metals. However, despite improvements in both prediction and prevention methods, including passive and active treatment, acid mine drainage problems persist. This is especially true in the Appalachian area and less so in the Mid-Continent area.

Industry, government and educational institutions have studied this environmental concern for a great many years. In 1977, Congress passed the Surface Mining Control and Reclamation Act (SMCRA) which included some funding and goals to address acid mine drainage. The coal companies were assessed a fee on each ton of coal that was mined to assist states in the reclamation of abandoned coal mine sites. The OSM "Fiscal Year 2009 Grant Distribution, AML Fund Collections and Allocations for FY 2009" report of November 30, 2009, noted that from January 30, 1978, through fiscal year 2009, the fee collections from industry totaled \$9.1 billion. For this same period, appropriations from the fund to the States and tribes to reclaim lands totaled \$6.8 billion.

The states spend these grant funds on their priority listing of abandoned mined land sites based on a variety of environmental and safety parameters, including dangerous highwalls and impoundments, clogged stream and stream lands, dangerous piles, embankments and slide areas, etc. Depending upon the severity of the listed sites, they are categorized as a Priority 1, 2 or 3, with Priority 1 being the most eminent to reclaim.

Acid mine drainage concerns could be mixed with any or all of the priority sites. Funding to address these concerns was in part included in Section 402(g) (6) of SMCRA which allowed states to retain up to 10 percent annually of the OSM AML grant to be deposited into a special trust fund. These funds and interest acquired were to be used for acid mine drainage abatement and treatment. Numerous Eastern states took advantage of this funding option. This potential funding option was enhanced on December 9, 2006 with the passage by the 109<sup>th</sup> Congress of the “Tax Relief and Health Care Act of 2006.” The bill was signed by President George Bush on December 10, 2006 and contained several significant provisions including:

- Extending the AML Fee Collection Authority of OSM to September 30, 2021.
- Mandatory allocation of funds for certain reclamation grants.
- Increasing grant amounts for AML programs that receive minimum-level funding.
- Increased set-a-side funds for acid mine drainage plans.

The OSM, Federal Assistance Manual, Section 4-40-10 Policy for Acid Mine Drainage Set-Aside Funds part B, was revised to state: “Of the AML funds distributed annually from State or Tribal shared (402 (g) (1) and Historic Coal share (section 402(g) (5), a State or Tribe may retain and deposit up to thirty (30%) percent from each source into its AMD trust fund (OSM. 2008b).” This alone will equate to over a billion dollars potentially available to the states to address current and, potentially, future AMD problems.

Since the passage of SMCRA, OSM has put forth various initiatives to address AMD concerns. One such program was the Appalachian Clean Streams Initiative (ACSI) which began as a broad plan in the fall of 1994 with the primary focus to prevent, eliminate and remediate acidic drainage from abandoned coal mines in the Appalachian Region. The ACSI program coordinated with, and created partnerships with governmental and private resources to clean up acidic drainage from abandoned coal mines in the eastern United States.

During the twelve year life of the ACSI program, it expanded to include 12 of the 26 coal mine states. Since the inception of the program to its termination by the passage of the Tax Relief and Health Act of 2006, OSM has provided supplemental grants of over \$50 million for 198 clean stream projects (OSM.2008d).

During 1997, the acting OSM Director, Katharine Henry, noted that prevention of future acid and toxic discharges from coal mining operations into surface and ground waters and the remediation of mining-related pollution discharges was one of the high priorities of the agency. An OSM AMD Policy Team was established. After extensive input from all affected parties and stakeholders, policy goals, objectives and strategies were developed to protect the hydrologic balance in coal mining areas from the effects of AMD.

In 1999, OSM expanded the options in addressing AMD and initiated the Watershed Cooperative Agreement Program (WCAP) as part of the Appalachian Clean Streams Initiative. The purpose of this program was to develop partnerships and assist local not-for-profit organizations in funding for the remediation of small local AMD concerns. An application for funding assistance by an organization is required to contain the following elements:

- AMD site must have approval of State Regulatory authority.
- Meet SMCRA eligibility criteria including NEPA, permits etc.
- Documented public support for the project.
- A plan to address ongoing maintenance
- Provided grants up to \$100,000.00
- Project to be completed within two years (OSM. 2008c).

In developing partnerships to clean-up the AMD, the partners have included some of the following:

- Local, county, state, federal agencies, RC&D's and other 501(C)(3) not for profit groups.
- School groups, including Science Clubs, Wildlife Clubs, Aviation and Key Clubs, Pep Clubs, etc.
- Various civic organizations such as Pheasants Forever, Lions, Kiwanis, Knights of Columbus, Cub & Boy Scouts, Girl Scouts, Izaak Walton League (Ikes) and others.
- Universities, Businesses, Industry, Suppliers, Farmers, and etc.

These partners have provided a variety of services including funding and in-kind services. These in-kind services have included land, soil material, trees, mulch, equipment, technical expertise, laboratory analysis, volunteer workers, supplies and many other services.

This program expanded rapidly in several eastern states, as strong and very proactive local watershed groups and other environmentally conscious organizations looked for ways to assist in cleaning up the environment - especially as it affected the water of the area and its potential effects on their economy and living environment.

A significant goal of the program is for the watershed groups to provide at least 60% funding of the total project, in cash or in-kind services. From 1999 through September 31, 2009, 186 cooperative agreement projects were initiated with an investment from the OSM Watershed Cooperative Agreement Program of over \$16.6 million. Eight hundred twenty six partnerships contributed over \$51.1 million with a total funding of approximately \$67.7 million. These partnership contributions included 317 in-kind services, 425 financial contributions and 86 in-kind and financial contributions. This is an average of 4.5 partners per project (Hartless. 2009).

The Cooperative Watershed Agreement Program in the Appalachian areas expanded rapidly. Within the region there are many well organized private organizations which became partners that assisted in identifying and reclaiming AMD lands that were greatly affecting their water quality, aquatic habitats, fish and wildlife resources, and aesthetics of their areas. As a result of this pro-active partner-shiping, many well organized citizen groups have been formed to work with the communities in cleaning up the AMD on a local and a regional level. These groups seek out state, local, federal, and private partnership funds to assist in the AMD cleanup efforts.

The partnership movement in the mid-west to address AMD has not been as extensive as it has been in the Appalachian areas. Major AMD concerns exist; however, except for the State regulatory agency, most organizations have been unaware of various options to create partnerships to address this environmental concern. For example, since active coal mining in Iowa ceased in 1993, many of the citizens, governmental and civic organizations are unaware of the numerous abandoned coal mine lands in their communities. These abandoned coal sites have created acid mine drainage. The toxic runoff has degraded the local watersheds, water supplies, aquatic and other wildlife, vegetation viability, recreation and other environmental concerns. By

educating these groups, they have come to realize where this AMD originates and the avenues to address the concern.

Now, OSM, the State of Iowa and several civic and governmental organizations including the Pathfinders RC&D, private individuals, local governments, school groups and other community organizations have developed a unique working relationship by creating partnerships to ameliorate and/or completely reclaim local AMD concerns in south central Iowa. These partnerships have been active during the past five years participating financially and with in-kind items to completely reclaim 10 AMD/AML sites.

Partnerships to address AMD are essential in states like Iowa. Due to the low level of past coal production in Iowa, OSM has classified Iowa as a minimally funded state. Therefore, Iowa currently receives 1.5 million dollars annually in the form of a grant from OSM. This funding is projected to increase incrementally over the next few years to 3 million dollars annually. Since many of their AMD/AML projects exceed this annual AML dollar allocation, partnerships have been formed to leverage AML dollars with the partnership dollars to address the AMD concerns and assist in reclaiming some of these sites.

Partnerships have been created by developing a solid working relationship with the various levels of government, RC&D's, school, industry and citizen groups and others. By demonstrating to them that the environmental degradation from toxic AMD runoff, which affects the local watersheds, water supplies, aquatic and vegetation viability, recreation and other activities, can be treated and eliminated, the partnerships expand. With the reclamation of the site, the land is returned to productive uses including crop lands, grazing, recreational activities, industrial, and other uses.

In creating a unique working relationship with the State and the RC&D's, all parties seek out new partners. Governmental and organizational training sessions and public awareness sessions with power point presentations, have been presented to local entities such as the Izaak Walton Group, Pheasants Forever, county commissioners, watershed groups, farmers and civic groups and others. These sessions present the process of becoming a partner and the benefits of this partnership in eliminating the AMD, reclaiming the site and enhancing their local environment.

The success of these numerous meetings is that the partnerships have been developed, and they have contributed significant funds as well as in-kind services to assist in the reclamation of the ten AML/AMD sites in Iowa. As these partnerships are created, they have applied and received WCAP grants from OSM of approximately \$100,000 each.

Over the past four years, the partners on the ten AMD/AML Iowa sites have contributed 82% of the total reclamation project costs. In 2009, the partners contributed 88% of the total project cost on three sites. The total reclamation cost of these projects exceeded \$5.6 million with partnership dollars of \$4.6 million. Partnership dollars represented 83 percent of the total cost. The average number of partners per project was 6.1. These partnerships have assisted in improving the water quality and the environment of the Muchakinock Creek Watershed, and other watersheds. Some reclaimed sites will also provide recreational facilities for the community of Oskaloosa.

#### **Example of reclaiming an AMD/AML site**

The following are examples of the successful AML/AMD projects, which are reclaimed or are in the process of being reclaimed within the State of Iowa. The end results of these reclamation projects demonstrate the power of partnerships between the State AML program, watershed groups and other concerned governmental, private organizations, other stake holders and the citizenry. Four partners entered into a contract to reclaim the Westercamp site. Due to the size of the area, the site was reclaimed under two separate contracts. The Westercamp I project site consisted of approximately 32 acres of highly eroded soils and vertical openings. The erosion gullies, vertical openings and acidic spoil material was polluting springs which drain AMD into the Muchakinock Creek. This creek is part of the Muchakinock Watershed. The acidic sediment materials were carried downstream during rain events killing vegetation and damaging downstream habitat.

The Westercamp II AML/AMD reclamation project site consisted of approximately 40 acres. The highly erodible acidic materials were within 500 feet of the Muchakinock Creek. Also an active polluted spring drained overland about 300 feet into the Muchakinock Creek. During rain events, water run-off transported large volumes of acid forming material immediately north of a county highway which runs west from the municipality of Beacon. The



acidic sediment was carried downstream during rain events killing vegetation and damaging downstream habitat. The acid forming material was deposited into the Muchakinock Creek.



Figure 1. Westercamp before reclamation



Figure 2. Westercamp after reclamation

Six of the thirteen ponds on the project site had AMD concerns. The water quality data for these ponds are listed below.

Table 1. Water Quality Parameters of Ponds on the Westercamp sites I and II with Acidity Concerns.

Sample Location	Temperature *C	Dissolved Oxygen (mg/l)	Specific Conductance	pH	Turbidity (NTU)	Total Iron (mg/l)
Pond 4	10.0	6.5	1860	3.11	8.0	34.67
Pond 6	10.6	9.5	498	3.41	1.7	1.31
Pond 7	11.1	7.0	2020	2.95	1.5	32.29
Pond 8	12.5	8.2	19.20	3.11	2.7	22.05
Pond 10	11.4	8.8	2150	2.79	1.4	44.76
Pond 13	11.9	7.8	1334	5.23	2.1	0.74



Figure 3. 2008 Field Day at Westercamp I site



Figure 4. Field Day at Westercamp I Site

The ponds which were acidic were treated with NaOH raising the pH to an acceptable level, drained and eliminated. Other ponds with acceptable water were enlarged.

To celebrate the success of this project and other partnership reclamation projects, a field day celebration was held on the Westercamp I site to recognize and honor the partners and their team for improving the environment. The first field day/public meeting celebration was held on May 13, 2008, and was sponsored by the Mahaska County Soil and Water Conservation District.

More than 60 people attended the field day celebration. Mr. Matt Lechtenberg, Project Coordinator, with the Muchakinock Watershed, Mahaska County Soil and Water Conservation District informed the group that by the end of 2008, over three million dollars will have been spent in the Muchakinock Creek watershed as a result of partnering with various federal, state, and local agencies and with numerous citizen groups. These groups include the Izaak Walton League, Pheasants Forever, watershed landowners, citizen groups and farmers. Also attending the meeting was the Iowa Secretary of Agriculture and the Assistant Secretary of Agriculture, representatives from the Governor's office, the Iowa Watershed Improvement Review Board, Pathfinders RC&D board members, OSM, Mahaska Soil and Water Conservation District personnel, representatives from the Iowa Legislature, contractors, Natural Resource Conservation Service, private engineering firms and other partners.

The second field day /public meeting was held on June 9, 2009, at the Westercamp II



Figure 5. 2009 Field Day at Westercamp II site

AML/AMD reclamation site near Beacon, Iowa. The field day focused on the development and accomplishments of the partnership between the stakeholders and government staffs in improving the water quality of the Muchakinock Creek Watershed. Due to the success in enhancing the watershed and the environment of the area many more people attended this gathering, approximately

97 people. The group included many stakeholders and partners including Senatorial and Congressional representatives, the Iowa Secretary of Agriculture, federal, state and local government officials, contractors, the Oskaloosa Herald newspaper, university press, Pathfinders

RC&D, IDSC, OSM, Mahaska Soil and Water Conservation District, other RC&D organizations and many interested citizens and partners.

The Muchakinock Creek Watershed is greater than 50,000 acres and transects Mahaska County. This watershed includes cropland, pasture, and abandoned mine land features. Improvements in the watershed range from terrace construction to reclamation of surface coal mines which were abandoned 50 years ago.

The Westercamp II Reclamation Project is just one of three partnership AMD/AML projects



Figure 6. Westercamp II during reclamation

reclaimed or being reclaimed in the watershed during 2009. This project was reclaimed with funding of four major partners.

Also highlighted during the field day were conservation practices which included terrace construction, grade stabilization structures, wetland mitigation, and soil neutralization. The State, RC&D and OSM were on hand to answer questions and give tours of this and a few other partnership sites being reclaimed in the area.

The McLandsborough AMD/AML Reclamation project located in Mahaska County, Iowa



Figure 7. McLandsborough before reclamation

was initiated in May 2009. The site consists of approximately 115 acres of land which were surface mined around 1970. Acidic water from spoil piles and acidic pit ponds draining from the site enters directly into a tributary of Spring Creek which is within one-half mile of the site. Spring Creek in turn enters the South Skunk River, which is approximately two miles downstream from the McLandsborough site.

The acidic water was treated with sodium hydroxide and once the Ph level was acceptable, the water was drained into a channel to a receiving stream. The dry pond was then graded and covered with suitable soil. Agricultural

limestone was incorporated into the top 12 inches of the subgrade to neutralize the acidic spoil material. In addition, the construction of terraces, two ponds, and a wetland were established. These efforts along with the establishment of vegetation eliminated the AMD concerns in the area.

Partners in the reclamation of the site include Mahaska County, Mahaska County Pheasants Forever, Iowa Division of Soils, OSM and Pathfinder RC&D.

Two other partnership reclamation sites were completed during 2009. The first was the Westercamp II reclamation project site which was discussed in part previously. This site consisted of approximately 40 acres. The highly erodible and acidic spoil material were polluting springs which drained into the Muchakinock Watershed and Muchakinock Creek. The acidic sediment materials were carried downstream during rain events killing vegetation and damaging downstream habitat.

Three partners cooperated in the funding of the reclamation of this site. These included the Pathfinders RC&D, the Mahaska Soil and Water Conservation District, and the Iowa Division of Soil Conservation (DSC).

The third partnership project completed in 2009 was the Edwards/American Coal Company Wash Plant #1 AML/AMD site. This site was a combined AML/AMD site (Edwards) and a bond forfeiture site (American Coal Company Wash Plant #1) which also used civil penalty funds.



Figure 8. Edward/American before reclamation



Figure 9. Edwards/American after reclamation

This is a 37-acre project site where reclamation was initiated in August 2008. The project site contains acidic spoil piles and three hazardous acidic water bodies. The runoff from the acidic

spoil piles had contributed to off-site damage through the sediment delivery of contaminated soil as well as causing acid mine drainage downstream that drains into the Des Moines River.

To eliminate the AMD concerns, the spoil piles were leveled burying the acidic material. Limestone was incorporated and covered with 12 inches of topsoil/clay material. The topsoil was also treated with an additional 2 T/ac lime, plus fertilizer. Terraces were installed along the slope above the existing pond. Straw mulch and seed were incorporated in the fall of 2009.

Partnership funds for this combined project came from the Mahaska Soil and Water Conservation District, Pathfinder RC&D, DSC AML and bond forfeiture funds and Civil Penalty funds from OSM.

Creative partners have even enhanced the recreational and education opportunities of the community of Oskaloosa, Iowa. For example, on the Waal West AMD/AMD project, the Izaak Walton League (Ikes) partner constructed fish habitat structures, which were placed in a large reconstructed fishing pond. Fishing docks were also constructed. The Ikes plan to host annual fishing derbies and will provide fishing and other opportunities for members and the general public throughout the years. Nest boxes and bird viewing blinds were constructed and placed on the site. Walking trails around the pond were developed and trees were planted. Interpretation signs are being developed identifying the effects of coal mining and successful reclamation. These signs will be placed along the walking trails. The reclaimed area will be fenced to keep neighboring cattle from entering the area.

Creating partnerships and expanding the partnerships to new stakeholders is a proven story of success. Over the past four years, the partners on the ten AMD/AML sites have contributed \$4,592,534 towards a total reclamation project cost of \$5,631,334.00. In 2009 the partners contributed \$2,111,105 towards a total project cost of \$2,411,105.00 on three sites. These partnerships have assisted in improving the water quality and the environment of the Muchakinock Creek Watershed, and will also provide recreational facilities for the community of Oskaloosa.

As a result of the many meetings and personal contacts with federal, state, and local governments and various agencies along with land holders, watershed groups, farmers, civic groups, etc., interest in forming partnerships to address AMD concerns is expanding. This partnership interest has accelerated with the field day celebrations combined with numerous

newsletter articles and articles of interest in several newspapers noting the success of partnership AMD reclamation. When the partners celebrate their success, the good news spreads.

For example, in working with other RC&D's in Iowa with AMD concerns from past coal mining in their counties, two new RC&D's entered partnerships to improve the environment of their areas. These two RC&D's are the Iowa Hartland RC&D which applied and received a Watershed Cooperative Agreement for the Long AML/AMD site in Marion County and the Chariton Valley RC&D which will be submitting a WCAP application in the near future.

The creation and expansion of partnerships to improve the environment and eliminate the AMD within the various watersheds have a proven record of success. This has been noted in newspaper articles, organizational newsletters, and TV coverage. These partnerships are expanding and are enhancing the overall amenities of the local communities and the environment in Iowa. The on-the-ground results of these partnerships serve as an example for other states as a way to demonstrate collaboration in achieving their environmental and conservation goals.

The Watershed Cooperative Agreement Program has continued since the passage of the 2006 Act. However, there are some funding concerns with the program. The question now is how long will this program be continued? Under Section 411, (h) (4) H.R. 6111 of the reauthorization bill, the Watershed Cooperative Agreements Funds must be appropriated and approved by Congress each year. Will Congress continue to approve this appropriation?

If future funds are not allocated annually from appropriated funds, what will happen to the potential AMD projects? Will the states set-a-side the allowable 30 % AMD set-a-side funds from the AML grants? If the states do set-a-side these hundreds of millions of dollars from their AML grants, when will these funds actually be spent? What will happen to the partnership groups? How long will the AMD continue in the coal mining states without being completely addressed? What is the long term impact on the environment? There are many unanswered questions.

Even with these concerns the partnerships created under the Watershed Cooperative Agreement Program are a success. Because of these successes in completely eliminating AMD discharges in Iowa, partner-shiping has expanded from one active not for profit organization to five. Within these groups, are several partnerships with civic organizations, watershed groups, land owners, school groups and many other organizations. Ten projects have been funded with

seven sites completely reclaimed at the end of 2009. These organizations are sharing their success with other not-for-profit organizations and they are educating their groups on how to participate in the WCAP.

The resulting actions will be an enhanced environment with, in most cases, the complete removal of the AMD concerns, aid in preserving the water quality, aquatic, and wildlife habitat of the affected areas as well as providing many other amenities to the citizens of the communities. Partner-shipping works!

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