GRIZZLY BEAR RECOVERY EFFORTS IN THE CABINET/YAAK ECOSYSTEM

WAYNE F. KASWORM, U.S. Fish and Wildlife Service, 475 Fish Hatchery Road, Libby, MT 59923, USA, email: kasworm@libby.org
TIMOTHY J. THIER, Montana Department of Fish, Wildlife, and Parks, P.O. Box 52, Trego, MT 59934, USA
CHRISTOPHER SERVHEEN, U.S. Fish and Wildlife Service, Forestry Sciences Laboratory, University of Montana, Missoula, MT 59812, USA

Abstract: Grizzly bear (*Ursus arctos horribilis*) conservation in the Cabinet/Yaak grizzly bear ecosystem (CYE) is an example of intensive efforts with a small population of approximately 30 individuals. The ecosystem is located in northwest Montana and northern Idaho and encompasses more than 6,800 km^2. The Yaak area adjoins bear habitat in Canada and is connected to Cabinet Mountains habitat by two 12-km wide corridors across the Kootenai River. Grizzly bear research was conducted in the Cabinet Mountains from 1983 to 1988 to determine habitat use and status of the population. The study concluded that the probability of the loss of this population ($n < 15$) in the next few decades was high. The study recommended that the population be augmented with transplants. A test of grizzly bear augmentation in the Cabinet Mountains began in 1990 to determine if transplanted bears would remain and reproduce. Four subadult female bears (2–6 years old) from southeast British Columbia were transplanted to the Cabinet Mountains during 1990–94. Research to examine population status, habitat use, and relations to human activities such as road building and timber harvest in the Yaak portion of the CYE began in 1986. Trapping resulted in the capture of 13 individuals. Trap nights required to capture a grizzly bear in the Yaak area were about 15% of that in the Cabinet Mountains. Though numbers of bears in the Yaak area may be small (n = 15–20), that subpopulation appears to be stable or increasing. Grizzly bear recovery goals for population demographic parameters, habitat management, and mitigation for mine development are discussed.

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Key words: Cabinet/Yaak ecosystem, grizzly bear, mitigation, Montana, population augmentation, recovery, transplants, *Ursus arctos horribilis.*

Grizzly bear populations south of Canada are currently listed as threatened under the 1973 Endangered Species Act (ESA, 16 U.S.C. 1531–1544). In 1993, a revised *Recovery Plan* for grizzly bears was adopted which identified specific measures to aid recovery (U.S. Fish and Wildl. Serv. 1993). Six areas were identified in the *Recovery Plan* as ecosystems in which grizzly bears were thought or known to occur. One of the areas identified was the Cabinet/Yaak Ecosystem (CYE) of northwest Montana and northeast Idaho. This area borders Canada and encompasses approximately 6,800 km^2. The Cabinet Mountains portion (approx. 4,000 km^2) lies south of the Kootenai River and the Yaak area borders Canada. Two 12-km wide corridors across the Kootenai River link the Yaak with the Cabinet Mountains. The degree of grizzly bear movement between the areas is unknown.

Prior to listing of the species as threatened in 1975, the grizzly bear population in the CYE was managed under an open hunting season requiring purchase of licenses prior to the beginning of the hunt and mandatory submission of heads and hides for tagging. In 1975, the Montana Department of Fish, Wildlife, and Parks (MDFWP) closed the hunting season.

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STUDY AREA

The CYE (48°30'N, 115°45'W) is located in northwest Montana and northern Idaho (Fig. 1). Approximately 90% of the ecosystem is public land administered by the Kootenai, Lolo, and Panhandle National Forests. The Kootenai Forest administers approximately 70% of the CYE. Other land owners include Plum Creek Timber Company Inc., smaller private ownership along valley bottoms, and numerous patented mining claims in the Cabinet Mountains.

The Cabinet Mountains range in elevation from 610 m to 2,664 m and have a Pacific maritime climate characterized by short, warm summers and heavy, wet winter snowfalls. The lower, drier slopes are dominated by stands of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*), whereas species at moist lower

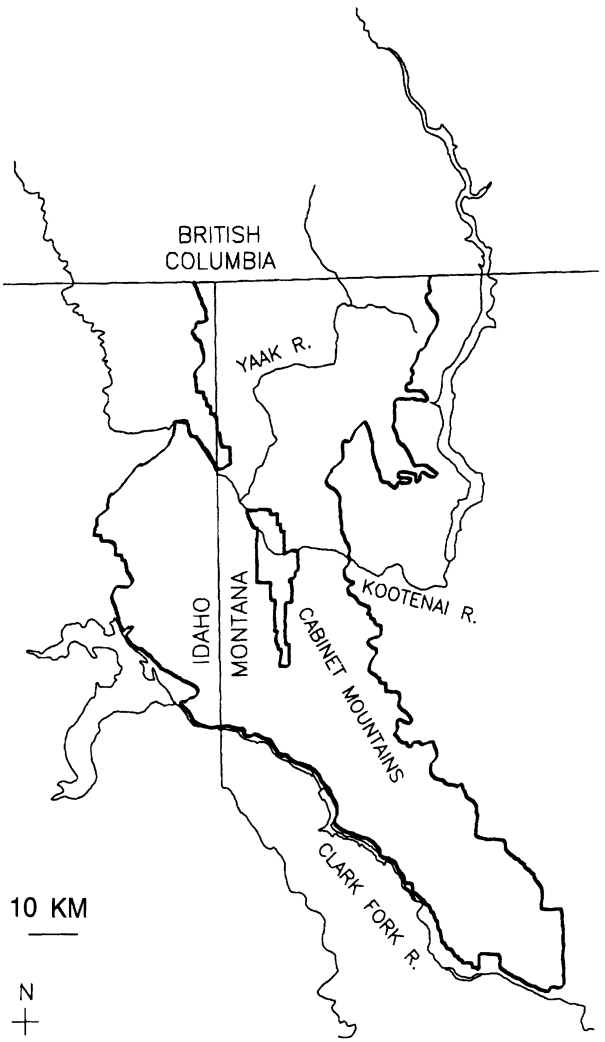

Fig. 1. Map of the Cabinet/Yaak grizzly bear ecosystem in Idaho and Montana, 1995. Heavy line denotes the recovery zone.

elevations include grand fir (*Abies grandis*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*). Stands of subalpine fir (*Abies lasiocarpa*), spruce (*Picea* spp.), and mountain hemlock (*Tsuga mertensiana*) predominate between 1,500 m and timberline. Mixed stands of coniferous and deciduous trees, riparian shrubfields, and wet meadows occur along the major drainages. Huckleberry (*Vaccinium* spp.) and mixed shrubfields are largely a result of the wildfires of 1910 and 1929. Fire suppression since 1929 has virtually eliminated wildfires from creating and maintaining berry-producing shrubfields.

The Yaak area has varied topography with rounded peaks and ridges. Elevations range from 550 m at the confluence of the Kootenai and Moyie Rivers to 2348 m. Climate is dominated by Pacific Maritime weather patterns with 100–150 cm of annual precipitation, primarily as snow. Coniferous forests predominate, with timber cutting units creating the primary form of habitat diversity. Middle portions of the Yaak River are low gradient and the river tends to meander, creating lush riparian zones and meadows. Vegetation is diverse, with western hemlock and western red cedar the indicated climax species on the majority of the study area. Ponderosa pine and Douglas-fir are common at lower elevations on south and western slopes. Subalpine fir and spruce predominate in the upper elevations and cirque basins. Large stands of lodgepole pine (*Pinus contorta)* and western larch (*Larix occidentalis*) occur at mid and upper elevations, largely the result of past wildfires.

Bears for Cabinet Mountains population augmentation were trapped during 1990–94 in the upper North Fork of the Flathead River and Wigwam River drainages in British Columbia, from 10 to 40 km north of the U.S. border. Subalpine fir was the climax species throughout most of the area. Early successional forest types, with lodgepole pine the most prevalent tree species, dominate a landscape which has resulted from recent wildfires, outbreaks of pine and spruce bark beetles (*Dendroctonus ponderosae* and *Dendroctonus rufipennis*), and logging. Although roads were relatively common in the area trapped, we observed very little public use of them. Grizzly bears are considered an important game animal in this portion of British Columbia and are hunted under a system of limited permits.

METHODS

Grizzly Bear Observations

Grizzly bear sighting forms were sent to a variety of field personnel from several agencies in the CYE to maximize reporting opportunities. All grizzly bear observations and reports of sign (tracks, digs, etc.) by agency personnel and the public were rated 1–5 for reliability, with 5 being the most reliable (Kasworm and Manley 1988). Sightings were field-verified by study personnel when possible.

Capture and Marking

Bears were captured with leg-hold snares following the techniques described by Johnson and Pelton (1980). Grizzly and black bears (*Ursus americanus*) were immobilized with tiletamine hydrochloride or a 2:1 mixture of ketamine hydrochloride and xylazine hydrochloride. Drugs were administered intramuscularly with a jab stick

or a dart gun. Immobilized bears were measured, weighed, and a first premolar tooth extracted for age determination (Stoneberg and Jonkel 1966).

Each bear was marked with an individually numbered tag in each ear. Attached to each ear tag was a 4 x 13 cm streamer of rubberized fabric to aid identification. To prevent constriction of the neck on young growing bears, a canvas spacer was placed in the radio collars that was designed to separate in 1–2 years (Hellgren et al. 1988).

Trapping efforts were conducted during the spring and early summer (before mid-Jul) and late summer and fall (early Sep–mid-Oct) from 1983 to 1995 in the CYE. Trap sites were usually located <200 m from an open road to allow vehicle access. Two-person crews checked snares daily. Bait consisted of road-killed deer, beaver (*Castor canadensis*) carcasses, moose (*Alces alces*) entrails, and other meat scraps.

Trapping for population augmentation was conducted in the North Fork of the Flathead River in British Columbia during July 1990–94. Only female grizzly bears <6 years old (or prior to first reproduction) and >35 kg were considered for transplanting to the CYE. All other grizzly bears were released.

Transplanted animals were radiocollared and held in a culvert trap until the cooler evening hours before transport to the Cabinet Mountains. Bears were released the following morning at a remote release site approximately 12 km behind a gated road. Time from immobilization to release were minimized to limit exposure to humans and was approximately 24 hours.

Radiomonitoring

We tried to obtain weekly aerial radio-locations on native grizzly bears during the 7–8 months in which they were active. Transplanted bears were monitored daily for 2–3 weeks after release and usually 3 times/week following. Ground locations were attempted as often as possible. Monitoring was conducted as long as the animal wore a collar. We calculated home ranges using minimum convex polygon techniques (Mohr 1947).

RESULTS AND DISCUSSION

Distribution, Reproduction, and Mortality

The *Grizzly Bear Recovery Plan* (USFWS 1993) uses sightings of females with cubs and human-caused mortalities during the preceding 6 years to estimate population size and mortality rates. We received 152 grizzly bear sightings that rated 4 or 5 for credibility during 1989–94. Of these sightings, 83 occurred in the Yaak portion of the ecosystem and 42 occurred in the Cabinet Mountains. Twenty-seven sightings occurred outside the ecosystem boundary. Females with young accounted for 23 sightings. Several of the family group sightings could not be reliably classed as cubs, yearlings, or 2-year olds and were therefore treated as females with young.

We had 4 field-verified female with cub observations for an average 0.67 females with cubs/year during 1989–94, and 13 additional credible sightings of females with young were reported. The total was screened to avoid duplicate sightings. If a third of the public sightings of females with young were females with cubs-of-the-year (based upon a 3-year breeding cycle), there would be 4 additional adult females during 1989–94. These additional females with cubs would raise the 6-year average to 1.33, below the recovery plan criteria of 6.0 females with cubs/year (Table 1).

Recovery plan criteria require 18 of 22 bear management units (BMU) to be occupied by females with young. BMUs were subjectively designated within the ecosystem, but approximate the size of an adult female home range (260 km^2) and contain all seasonal habitats required by a grizzly bear. Eight of 22 BMUs had verified sightings of females with young during 1989–94. Six additional BMUs provided credible sightings of females with young (Table 1). Some occupancy was determined by sightings of radiocollared bears and may produce repetitive sighting information. For instance, 1 radiocollared adult female occupied 6 BMUs and another collared female occupied 2 BMUs.

Table 1. Grizzly bear recovery plan goals and Cabinet/Yaak ecosystem values, 1989–94.

	Mean females with cubs, 1989–94	Bear management unit occupancy by females with young, 1989–94	Females with cubs, 1992–94	Calculated population	Human-caused mortality rate (%), 1989–94	Human-caused female mortality (%), 1989–94
Recovery plan goals	6.0	18 of 22	18	106	4	30
Cabinet/Yaak Ecosystem	1.33	14 of 22	5	29	1.1	0

Population levels were calculated by dividing total females with cubs (5) from 1992 to 1994 by 0.6 (sightability) and dividing by 0.284 (adult female proportion of population) as specified in the recovery plan (USFWS 1993). This resulted in a population of 29 (Table 1).

The recovery plan states that human-caused mortality should not exceed 4%, of which 30% may be females. Four known mortalities of grizzly bears have occurred in or near the CYE during 1989–94, with only 2 of these believed to be human caused. One of these mortalities was a subadult female and 1 was a subadult male. Average annual human-caused mortality rate would be 0.33 bears/year. The human caused annual mortality rate calculated from a population of 29 would be 1.1% (Table 1).

Nuisance Grizzly Bear Transplants

Seven nuisance grizzly bears (3 males and 4 females) from other ecosystems were transplanted to the CYE on 4 occasions from 1977 to 1982. The individuals were yearlings or orphaned cubs and were transplanted because of livestock depredation or frequenting populated areas. Three of the 7 bears were known to be dead and 2 others were recaptured and removed from the area as nuisance animals.

Cabinet Mountains Research

Research on native grizzly bears began in the Cabinet Mountains during the late 1970s. Surveys by Erickson (1978) concluded that the population was approximately a dozen animals. Trapping efforts in 1979 and 1980 failed to capture any grizzly bears, but a female and yearling were observed (Thier 1981).

From 1983 to 1988 research was conducted in the Cabinet Mountains to determine habitat use and the status of the population (Kasworm and Manley 1988). The study concluded that the continued existence of the grizzly bear population in the Cabinet Mountains ($n < 15$) was in serious doubt and that the probability of the loss of this population in the next few decades was high. This conclusion was based on: the capture of only 3 grizzly bears despite an extensive trap effort, the advanced age of the individuals captured (11–28 years old), few grizzly bear sightings, only 1 observation of a female with young, and the high mortality of marked bears (1 of 3). Furthermore, the study recommended that the population be augmented through transplant of additional animals.

Two approaches for augmenting the population were proposed (Servheen et al. 1987, USFWS 1987). The first involved transplanting subadult female grizzly bears from other areas of similar habitat to the Cabinet Mountains. Only bears with no history of conflict with humans would be moved and subadult females were recommended because of their smaller home ranges and potential reproductive contribution. The second approach relied on cross-fostering grizzly bear cubs to black bear females. Under this approach, grizzly bear cubs from zoos would be placed in the maternal dens of black bear females during March or April. Although cross-fostering has not been tested, surrogate black bear females have successfully fostered orphaned black bear cubs (Alt 1984, Alt and Beecham 1984).

The public expressed concern over 3 items: human safety, conflicts with other land-uses, and long-term grizzly bear population goals. A citizens' involvement committee was formed to aid information exchange between the public and agencies (Servheen et al. 1995). The first product was a question-and-answer brochure regarding grizzly bears in the CYE and was mailed to about 12,000 post office box holders in Lincoln and Sanders counties, Montana. In response to concerns expressed by the committee, the augmentation proposal was modified to eliminate cross-fostering and to reduce the number of transplanted bears to 4 individuals over 5 years. The beginning date of augmentation was postponed for 1 year to allow additional public information and education programs. Concerns regarding cross-fostering included: lack of previous testing, fear that nuisance black bears would now be accompanied by grizzly bears, and the unnaturalness of the technique. The citizen's committee is still active with regular meetings for information dissemination and discussions regarding grizzly bear research and management.

In July of 1990 trapping of bears for transplanting to the Cabinet Mountains began in southeast British Columbia. Subadult female grizzly bears approximately 2–6 years of age in good physical condition and prior to first reproduction were targeted. All bears were to be obtained from backcountry areas and to have no history of conflict with humans. Furthermore, bears would be moved during July when food resources such as berries were ripening in the Cabinet Mountains. Though initial plans involved transplanting 1–2 bears/year, only 1 bear was moved/year during 1990, 1992, 1993, and 1994 (Table 2). No bears were captured during 1991 that met the sex and age criteria. To obtain the 4 subadult females transplanted, 22 different grizzly bears were captured during 840 trap-nights. A trap-night was 1 site with 1 or more snares set for 1 night. Capture rates were 1 grizzly bear/38 trap-nights, and 1 suitable subadult female/210 trap-nights.

The first criterion for transplant success was residence in the Cabinet Mountains. Three of 4 transplanted bears

Table 2. Status of female grizzly bears transplanted to the Cabinet Mountains, 1990–95.

Bear	Age	Weight (kg)	Capture date	Days monitored	Home range (km^2)	Comments
218	5	71	21 Jul 1990	411	555	Lost collar 4 Sep 1991. Observed Jul 1992 without cubs in Cabinet Mountains.
258	6	70	21 Jul 1992	358	400	Produced 1 cub in 1993, but found dead (natural mortality) 13 Jul 1993 in Cabinet Mountains. Cub believed dead.
286	2	36	14 Jul 1993	482	265	Lost collar 7 Nov 1994 in Cabinet Mountains.
311	3	75	12 Jul 1994	41	N/A	Lost collar 25 Jul 1994. Recaptured outside Cabinet Mountains 30 Sep 1995. Relocated to Cabinet Mountains and recollared. Lost radio signal 26 Oct 1995.

remained within the target area for at least 1 year (Table 2). The fourth individual left the target area but was recaptured and returned to the Cabinet Mountains. The signal from the collar was lost 1 month after the relocation while the bear was in the Cabinet Mountains. No conflicts with humans were reported and sightings by the public were few.

The second criterion for success was reproduction. Bear 258 found sufficient habitat and food resources to rear a cub the year after being transplanted (Table 2), but this cub was not sired by a Cabinet Mountains male and it did not satisfy that criteria. Though this bear died and the cub was believed to have died, necropsy indicated the death was not human caused or related to malnutrition. The 1995 ages of the remaining transplanted bears would be 9, 4, and 4 years old. With an assumed first age of reproduction of 6 years, only 1 of these bears is likely to have produced cubs. Although preliminary signs of residence were encouraging, longer-term monitoring will likely be necessary to determine ultimate reproductive success of the transplants.

Yaak Research

Prior to 1986, little work was conducted on grizzly bears in the Yaak. A study on black bears in the Yaak River drainage in 1986 and 1987 resulted in the capture and radiocollaring of 5 grizzly bears (Thier 1990). A long-term grizzly bear study was initiated in 1989. Twenty-five captures of 13 individual grizzly bears were made during 3,472 trap nights from 1986 to 1994 (Kasworm and Servheen 1995). Capture rate was about 6 times greater than in the Cabinet Mountains.

The first individual captured was an adult female with 2 cubs. Monitoring and additional captures have shown that this individual has produced 11 young in 10 years and that a female offspring has produced young. Two of the 13 bears captured were known to have died during the study period. One was killed by another grizzly bear while caught in a snare and the other was killed in the hunting season in British Columbia. In addition to these, a bear is suspected to have been illegally shot.

Habitat Protection and Management

The principle land management agency for grizzly bear habitat in the CYE is the USFS. Forest plans, completed by each forest between 1986 and 1988, list standards and guidelines for management of grizzly bear habitat which follow the Interagency grizzly bear guidelines (USFS 1986). These guidelines provide a common basis for management across grizzly bear habitat. More than 90% of the USFS-administered lands in the CYE were classified as Management Situation 1, meaning that these lands are key to the survival of grizzly bears on an annual or seasonal basis and management decisions must favor the bear and habitat.

Standards and guidelines for habitat manipulation were described in forest plans or have been developed through Section 7 of the ESA. Activities that may affect grizzly bear habitat were reviewed by the USFWS as directed by Section 7. Many of the standards apply to road construction and timber harvest, but the standards also describe how to monitor recreation and other developments such as mining and ski areas. Standards may vary among national forest plans, and the following description applies largely to the Kootenai National Forest (USFS 1987).

Spring is a critical time for bears seeking food on habitat limited by snow cover. Spring habitat for bears should not be accessed for timber harvest activities until 15 June. The removal of cover may adversely affect bears by increasing mortality risk and may reduce habitat available to bears. To address these concerns, even-aged timber management should be limited to an area <16 ha for green timber removal. In cases involving

timber salvage from fire, insects, or disease, this standard has been relaxed and balanced with road obliteration and visual breaks. At least 183 m of cover should be left between openings that are void of cover.

Roads and the effects of human disturbance were managed through road density standards and cumulative effect analysis. The standards were applied to BMUs and subunits within BMUs. Numbers of subunits within a BMU vary and relate largely to drainages. A road density standard of 0.47 km/km^2 was applied within each subunit. Cumulative effect calculations required maps of all human activities within the BMU including roads, trails, campgrounds, resource extraction activities, and intensive recreational areas. Each of these activities has a zone of influence and a displacement coefficient which was used to calculate an area and deduct it from the total. The area of the BMU free of human activities should not fall below 70%. When major resource extraction activities occur, bears may be displaced into adjacent habitats. To ensure the availability of adjacent secure habitat, an adjacent subunit was kept free of major activities during resource extraction.

Mitigation of Large Mining Activity

In 1993 the Final Environmental Impact Statement Record of Decision (USFS 1993) was issued on the Montanore Project in the Cabinet Mountains. This proposed silver–copper mine has a permit area of 14 km^2, most of which is within the recovery zone. The mine would employ approximately 400 people and have an operational life of at least 16 years, including construction and reclamation. All applicable standards from the Kootenai Forest Plan were used in the mine development plan. Several additional mitigative measures were adopted specific to grizzly bear management.

The mining company will be required to fund an additional wildlife law enforcement position and an information–education specialist for the project area. The company must purchase or obtain conservation easements on 11.4 km^2 of replacement habitat within the Cabinet Mountains. An oversight committee composed of agency officials will determine the actual properties acquired and the proportion of easements and acquisitions. Furthermore, the company must agree to manage any lands it might obtain through the mine patenting process in a manner that protects the land for grizzly bear use following mine closure. Dates for construction and operation have not been announced by the company.

Sanitation Issues

The CYE has a history of black bear problems and, more recently, grizzly bear problems at garbage dumpsters. In 1994 and 1995, bear-resistant dumpsters were purchased for several sites through a cooperative effort among Lincoln County, the International Grizzly Fund, Brown Bear Resources, MDFWP, USFS, and the USFWS with matching funds provided by the National Fish and Wildlife Foundation. This partnership of organizations and agencies proposes to phase out open dumpsters with bear-resistant dumpsters over the next several years. Lincoln County has several other garbage collection sites both on the periphery and in grizzly bear and black bear habitat and has recently undertaken programs to minimize bear–garbage problems through more frequent collection, fencing, and site consolidation.

Future Management Concerns

Approaches to road management have evolved from open road density calculations to computer-aided open road, closed road, and motorized trail inventories (Mace and Manley 1993, Interagency Grizzly Bear Comm. 1994). These concepts will be applied to the CYE when local grizzly bear data has been analyzed to produce management standards. Application of these standards is expected during 1996.

Another major mining operation in the Cabinet Mountains has been under analysis since 1987, and a draft Environmental Impact Statement was released in 1995 (USFS 1995). This mine was proposed for an area 9 km west of the Montanore mine and would access minerals under the Cabinet Mountains Wilderness. Size of the project and levels of employment were expected to be similar to that of Montanore. These 2 mine projects risk fragmenting almost 1,300 km^2 of the southern CYE.

A recreational downhill ski area has been proposed for the north end of the Cabinet Mountains. Proposals suggest a winter-only operation with 2 chair lifts and a day lodge without overnight lodging. The site lies within a roadless area considered for additions to the wilderness system and the Libby city watershed.

Grizzly bear populations in the Yaak portion of the CYE may be responding to management actions by a slow increase in numbers (n = 15–20). However, the Cabinet Mountains population is at a critical point. Habitat management and mitigation for development must consider the tenuous nature of this small population of grizzly bears. To maintain the Cabinet Mountains population, additional population augmen-

tation will likely be necessary in addition to intensive habitat management in the corridors across the Kootenai River. Negative public attitudes toward grizzly bears must be addressed. Recovery actions will probably move slowly in order to build public trust and understanding.

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