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DISTRIBUTION AND ABUNDANCE OF THE RIO GRANDE SUCKER IN THE CARSON AND SANTA FE NATIONAL FORESTS, NEW MEXICO

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ABSTRACT—Rio Grande sucker (*Catostomus plebeius*) was once common in the Rio Grande basin; however, its current status in New Mexico is unknown. We surveyed 20 streams for Rio Grande sucker in the Carson and Santa Fe National Forests in northern New Mexico. Rio Grande sucker were found in 3 streams on the Carson National Forest. In 2 of these streams Rio Grande sucker co-occurred with white sucker (*Catostomus commersoni*). On the Santa Fe National Forest, Rio Grande sucker occupied 11 streams in the Jemez River drainage and 2 streams in the Chama River drainage. Rio Grande sucker co-occurred with white sucker in 1 of the 2 streams draining into the Chama River drainage. The abundance of Rio Grande sucker was inversely proportional to stream gradient.

RESUMEN—El matalote del Rio Grande (*Catostomus plebeius*) antes era muy común en la cuenca del Río Grande. Sin embargo, su estado actual en Nuevo México es desconocido. Se condujo una investigación en 20 arroyos en los Bosques Nacionales de Carson y Santa Fe en el norte de Nuevo México, buscando al matalote del Río Grande. El matalote fue encontrado en 3 arroyos en el Bosque Nacional Carson. En 2 de estos arroyos el matalote del Río Grande ocurrió con el matalote blanco (*Catostomus commersoni*). En el Bosque Nacional Santa Fe, el matalote del Río Grande se encontró en 11 arroyos en la cuenca del Río Jémez y 2 arroyos de la cuenca del Río Chama. El matalote del Río Grande convivio con el matalote blanco en 1 de los 2 arroyos que desembocan en la cuenca del Río Chama. La abundancia del matalote del Río Grande fue inversamente proporcional la pendiente del arroyo.

Rio Grande sucker, *Catostomus* (*Pantosteus*) *plebeius* is an obligate riverine fish that favors low gradient (<3.5%), low velocity stream reaches (Calamusso, 1996). Once common in the Rio Grande Basin of Colorado and New Mexico (Koster, 1957; Sublette et al., 1990; Langlois et al., 1994; Rinne, 1995), it currently is listed as endangered in Colorado (Swift-Miller et al., 1999*a*, 1999*b*) and appears to be declining in the northern portions of its range in New Mexico (Calamusso, 1992; Calamusso and Rinne, 1996). In New Mexico, its current distribution is reported as the Rio Grande above the 36th parallel and its tributaries north of the 33rd parallel (Sublette et al., 1990). Rio Grande suckers also occur in the Mimbres River, and introduced populations are established in the Rio Hondo (Pecos drainage), Gila River basin, and San Francisco drainage (Sublette et al., 1990; Platania, 1991; Calamusso and Rinne, 1999). Rio Grande sucker also inhabit 6 river basins draining 4 states of Mexico (Hendrickson et al., 1980; Abarca et al., 1995).

Because of the apparent decline of the Rio Grande sucker and its uncertain status, this study was initiated in 1992 to document current distribution, status, and habitat use of the species in the Carson and Santa Fe National Forests of north-central New Mexico. Our goal was to document the extent of decline of Rio Grande sucker populations in northern New Mexico.

MATERIALS AND METHODS—*Study Area*—The area is generally mountainous with river valleys, mesas, and plateaus. Elevations range from 1,708 m in low-elevation grasslands to 4,001 m at Wheeler Peak in the Carson National Forest. Mean annual water yield from the Carson and Santa Fe National Forests is 425.3 hm^3 and 458.7 hm^3, respectively, and drains

into the Canadian, Pecos, and Rio Grande rivers; the latter receives the largest amount of this water yield. There are 926 km of perennial streams in the Carson National Forest and 994 km in the Santa Fe National Forest.

North-central New Mexico has a variable climate with cool summers and moderate winters. Mean daily air temperature ranges from −31.7°C to 10.0°C in winter and from −1.1° to 35.0°C in summer. Mean annual precipitation in the study area varies from 25.4 cm to 88.8 cm per year, with the greater amount falling at higher elevations.

Distribution—Delineation of the historic distribution of Rio Grande sucker began in 1992 with a review of museum records, agency reports, and published literature. Additional data were obtained from the New Mexico Department of Game and Fish and University of New Mexico Museum of Southwestern Biology. These locations were subsequently plotted on United States Geological Survey 7.5-min quadrangle maps and incorporated into a geographical information system. We surveyed historic watersheds and watersheds that were likely to contain Rio Grande sucker during the summers of 1992 through 1999. Fish were captured with a Smith-Root Model 12 backpack electrofisher using voltages ranging from 300 to 400 volts with frequencies of 75 to 90 pulses per sec. Electrofishing surveys commenced at the lower reaches of each stream and moved in an upstream direction. Surveys proceeded upstream until Rio Grande sucker were no longer captured.

Density—Density of Rio Grande sucker was estimated from 36 study reaches (18–100 m in length) in 6 streams during the summers of 1992, 1994, and 1995. A multiple-pass depletion method using a backpack electrofisher was used to sample fish (Zippin, 1958). Upper and lower limits of each study section were blocked with a 6-mm mesh seine to prevent fish from moving in or out of the section during sampling. All species of fish collected were recorded, measured (TL) to the nearest mm, weighed to the nearest g, sexed, and released below the study area. Analysis of variance (PROC ANOVA, SAS Institute Inc., 1988) was used to determine differences in density between years within streams and among streams. A Bonferroni Adjustment was used to judge significance for all possible pairwise comparisons among streams and to protect from type I error. To evaluate Rio Grande sucker abundance relative to stream gradient we used a simple linear regression model. All tests were conducted at the 0.05 significance level.

RESULTS—*Distribution*—Sixteen streams contained Rio Grande sucker in the study area (Fig. 1). In the Carson National Forest, 2 populations of Rio Grande sucker were confirmed and 1 new population (Little Tusas) was found. Previously documented populations of Rio Grande sucker in the Rio Grande del Rancho and El Rito creek (Sublette et al., 1990) appear to have been extirpated. Many Rio Grande tributaries draining the Carson National Forest and adjacent lands exhibited habitat characteristics that are considered suitable (gradient < 3.0%, pools and glides; Calamusso, 1996) for Rio Grande sucker, but they did not contain Rio Grande sucker. These tributaries are now inhabited by nonnative white sucker, *Catostomus commersoni*. In the Santa Fe National Forest, 11 populations were confirmed (Fig. 1) and 2 new populations (Rock Creek, Polvedera Creek) were documented. Surveys of streams that were determined to have suitable Rio Grande sucker habitat in the Santa Fe National Forest (Jemez Drainage) revealed an abundance of Rio Grande sucker. White sucker were not found in any streams of the Jemez River drainage in the Santa Fe National Forest above an irrigation dam that is located below the confluence of the Jemez River and Rio Guadalupe at the southern Forest Service boundary. In the Chama River drainage, Polvedera Creek supported Rio Grande sucker, whereas in Canones Creek Rio Grande sucker co-existed with white sucker. Rio Grande sucker were not collected in any stream reaches sampled with gradients >3.2%.

Density—The Rio Tusas had the highest mean density of Rio Grande sucker (2,350 fish/ha) followed by Rock Creek (2,150 fish/ha), Little Tusas (2,000 fish/ha), Rio de las Vacas (1,540 fish/ha), American Creek (1,280 fish/ha), and the Rio Vallecitos (871 fish/ha); however, analysis of variance indicated that there was no significant difference in density between years or among streams (ANOVA, $F = 0.169$, $P = 0.9$, 3 *df*).

Density of Rio Grande sucker in study sections varied from a high of 5,400 fish/ha in the Rio Tusas in August 1994 to a low of 100 fish/ha in American Creek in June 1995. Stream reaches with densities of Rio Grande sucker ≥2,000/ha or greater had a mean gradient of 0.8%, whereas sections with densities <1,000/ha had a mean gradient of 1.8%. Regression models indicate that abundance of Rio Grande suckers was positively correlated with decreasing gradient ($R^2 = 0.29$, $P < 0.01$; model: $y = -0.073x + 0.238$).

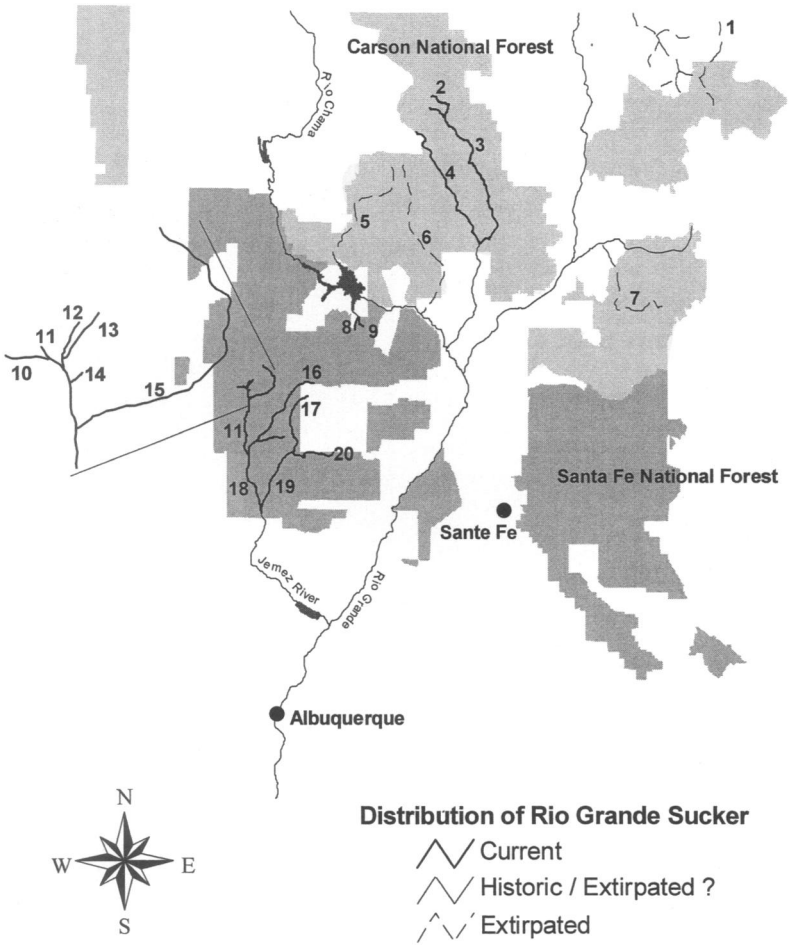

FIG. 1—Historic (documented) and current distribution of Rio Grande sucker in the Carson and Santa Fe National Forests, New Mexico. Streams are: 1) Rio Costilla, 2) Little Tusas Creek, 3) Rio Tusas, 4) Rio Vallecitos, 5) Canjillon Creek, 6) El Rito Creek, 7) Rio Grande del Rancho, 8) Canones Creek, 9) Polvedera Creek, 10) Clear Creek, 11) Rio De Las Vacas, 12) Palomas Creek, 13) American Creek, 14) Rock Creek, 15) Rito Cafe, 16) Rio Cebolla, 17) San Antonio Creek, 18) Rio Guadalupe, 19) Jemez River, 20) East Fork, Jemez River.

DISCUSSION—*Distribution*—Once widely distributed and abundant throughout the upper Rio Grande of Colorado and New Mexico, the Rio Grande sucker was the only catostomid endemic to this drainage (Koster, 1957; Sublette et al., 1990; Langlois et al., 1994). It is reasonable to assume that Rio Grande suckers once occupied all low gradient (<3.2%), middle-elevation tributaries to the Rio Grande in Colorado and New Mexico north of the 33rd parallel. In New Mexico, the species appears to be declining across its range (Propst, 1999; B. Calamusso, pers. obser.) and definitely is declining in the study area, especially in the Carson National Forest, on lands adjacent to the Carson National Forest, and in tributaries in the Santa Fe National Forest draining into the Chama River (Calamusso, 1992; Calamusso and Rinne, 1996; Calamusso and Rinne, 1999).

We hypothesize that the decline in range and numbers of the Rio Grande sucker is related to introduction and range expansion of nonnative fishes, especially white sucker, into the Rio Grande drainage. In all streams where Rio Grande sucker have been extirpated or are declining, white sucker are now present. A re-

view of historic records for the Carson National Forest indicates that Rio Grande sucker were once present in the Rio Tusas, Rio Vallecitos, Rio Grande del Rancho, Rio Costilla, and El Rito Creek, however, our surveys from 1992 to 1999 found Rio Grande sucker in only 2 of these streams (Rio Tusas, Rio Vallecitos; Fig. 1). Currently, Rio Grande sucker is the only catostomid that inhabits the Little Tusas, whereas white sucker co-occur with Rio Grande sucker in the Rio Vallecitos and Rio Tusas. In the Rio Costilla, Rio Grande del Rancho, and El Rito Creek, Rio Grande sucker appears to have been replaced by white sucker. Historically, Rio Grande sucker probably occupied Canjillon Creek, a tributary to the Chama River that lies west of El Rito Creek (Fig. 1), but they were not found during our surveys. White sucker now inhabit Canjillon Creek. The Rio Fernando de Taos, a tributary to the Rio Grande, and adjacent to the Carson National Forest, is within the historic range of the Rio Grande sucker. The lower reaches of this stream had habitat characteristics suitable for the native sucker (gradient 1%, numerous pools and glides), however no Rio Grande suckers were found. White sucker are now abundant in the low gradient (<2%) reaches of this stream. In the Santa Fe National Forest, Rio Grande sucker inhabit Polvedera Creek and co-occur with white sucker in Canones Creek. Streams of the Carson and the Santa Fe National Forests that drain into the Chama River have no known permanent barriers to colonization by white sucker.

In contrast, Rio Grande suckers were the only catostomid found in streams in the Santa Fe National Forest, Jemez River drainage. Streams in the Jemez drainage of the Santa Fe National Forest do not contain white sucker due to a barrier to upstream movement created by an irrigation dam on the Jemez River (Fig. 1). Additional research is warranted to determine mechanisms by which white sucker and other nonnative species limit abundance and distribution of Rio Grande sucker in New Mexico and Colorado.

Our results suggest a strong correlation between decreasing gradient and increasing abundance of Rio Grande sucker. McPhee (1963) noted this relation for trout and sculpins in Idaho, and Behnke (1992) noted an inverse relationship between gradient and abundance for salmonids in general. Recovery efforts directed at this species should consider the effect of nonnative species and stream gradient on the persistence and abundance of Rio Grande sucker when considering reintroduction sites.

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Literature Cited

Abarca, F. J., K. L. Young, I. Parra, R. H. Bettaso, and K. Cobble. 1995. Yaqui River fishes relevant to the Madrean Province: U.S.–Mexico collaborations. In: Debano, L. F., et al., technical coordinators. Biodiversity and management of the Madrean Archipelago: the sky islands of southwestern United States and northwestern Mexico. United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-GTR-264.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6:1–275.

Calamusso, B. 1992. Current distribution of *Catostomus plebeius* and *Gila pandora* on the Carson National Forest, New Mexico with preliminary comment on habitat preferences. Proceedings of the Desert Fishes Council 24:63–64.

Calamusso, B. 1996. Distribution, abundance, and habitat of Rio Grande sucker (*Catostomus plebeius*) in the Carson and Santa Fe National Forests, New Mexico. Unpublished M.S. thesis, New Mexico State University, Las Cruces.

Calamusso, B., and J. N. Rinne. 1996. Distribution of the Rio Grande cutthroat trout and its co-occurrence with the Rio Grande sucker and Rio Grande chub on the Carson and Santa Fe National Forests. In: Shaw, D. W., and D. M. Finch, technical coordinators. Desired future conditions

for southwestern riparian ecosystems: bringing interests and concerns together. United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-GTR-272. Pp. 157–167

CALAMUSSO, B. AND J. N. RINNE. 1999. Native montane fishes of the Middle Rio Grande Ecosystem: status, threats, and conservation. In: Finch, D. M., et al., technical coordinators. Rio Grande Ecosystems: linking land, water, and people. Toward a sustainable future for the Middle Rio Grande Basin. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. Proceedings RMRS-P-7. Pp. 231–237.

HENDRICKSON, D. A., W. C. MINCKLEY, R. R. MILLER, D. J. SIEBERT, AND P. H. MINCKLEY. 1980. Fishes of the Rio Yaqui Basin, Mexico and the United States. Journal of the Arizona–Nevada Academy of Science 15(3):65–106.

KOSTER, W. J. 1957. Guide to the fishes of New Mexico. University of New Mexico Press, Albuquerque.

LANGLOIS, D., J. ALVES, AND J. APKER. 1994. Rio Grande sucker recovery plan. Colorado Division of Wildlife, Montrose, Colorado.

MACPHEE, C. 1966. Influence of differential angling mortality and stream gradient on fish abundance in a trout-sculpin biotope. Transactions of the American Fisheries Society 95:381–387.

PLATANIA, S. P. 1991. Fishes of the Rio Chama and upper Rio Grande, New Mexico, with preliminary comments on their longitudinal distribution. Southwestern Naturalist 36:186–193.

PROPST, D. L. 1999. Threatened and endangered fishes of New Mexico. Technical Report No. 1. New Mexico Department of Game and Fish, Santa Fe, New Mexico.

RINNE, J. N. 1995. Reproductive biology of the Rio Grande sucker, *Catostomus plebeius,* (Cypriniformes) in a montane stream, New Mexico. Southwestern Naturalist 40:237–241.

SAS INSTITUTE INC. 1988. SAS/STAT User's Guide. Release 6.03. SAS Institute Inc., Cary, North Carolina.

SUBLETTE, J. E., M. D. HATCH, AND M. SUBLETTE. 1990. The fishes of New Mexico. University of New Mexico Press, Albuquerque.

SWIFT-MILLER, S. M., B. M. JOHNSON, R. T. MUTH, AND D. LANGLOIS. 1999*a*. Distribution, abundance, and habitat use of Rio Grande sucker (*Catostomus plebeius*) in Hot Creek, Colorado. Southwestern Naturalist 44:42–48.

SWIFT-MILLER, S. M., B. M. JOHNSON, AND R. T. MUTH. 1999*b*. Factors affecting the diet and abundance of northern populations of the Rio Grande sucker (*Catostomus plebeius*). Southwestern Naturalist 44:148–156.

ZIPPIN, C. 1958. The removal method of population estimation. Journal of Wildlife Management 22: 82–90.

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