

**UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT**

ATTORNEY GENERAL OF THE
STATE OF OKLAHOMA, State of
Oklahoma, ex rel. W.A. Drew
Edmondson, in his capacity as Attorney
General: OKLAHOME SECRETARY
OF THE ENVIRONMENT, ex rel. C.
Miles Tolbert in his capacity as the
Trustee for Natural Resources for the
State of Oklahoma,

Plaintiffs - Appellants,

v.

TYSON FOODS, INC.; TYSON
POULTRY, INC.; TYSON CHICKEN,
INC.; COBB-VANTRESS, INC.; CAL-
MAINE FOODS, INC.; CAL-MAINE
FARMS, INC.; CARGILL, INC.;
CARGILL TURKEY PRODUCTION,
LLC; GEORGE'S, INC.; GEORGE'S
FARMS, INC.; PETERSON FARMS,
INC.; SIMMONS FOODS, INC.;
WILLOW BROOK FOODS, INC.,

Defendants – Appellees,

And

STATE OF ARKANSAS,

Amicus Curiae.

No. 08-5154

JUDGMENT

Filed May 13, 2009

Before **KELLY, EBEL, and MURPHY**, Circuit Judges.

This case originated in the Northern District of Oklahoma and was argued by counsel.

The judgment of that court is affirmed.

Entered for the Court

A handwritten signature in cursive script, reading "Elisabeth A. Shumaker", with a long horizontal flourish extending to the right.

ELISABETH A. SHUMAKER
Clerk of the Court

**UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT
OFFICE OF THE CLERK**

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Denver, Colorado 80257
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Elisabeth A. Shumaker
Clerk of Court

May 13, 2009

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RE: 08-5154, Attorney General for Oklahoma, et al v. Tyson Foods, Inc., et al
Dist/Ag docket: 4:05-CV-00329-GKF-SAJ

Dear Counsel:

Enclosed is a copy of the opinion of the court in the captioned case. Judgment was entered today.

Please contact this office if you have questions.

Sincerely,



Elisabeth A. Shumaker
Clerk of the Court

cc: Jo Nan Allen
Justin Allen
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Tim Keith Baker
Sherry P Bartley
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J. Ron Wright

EAS/lg

May 13, 2009

Elisabeth A. Shumaker
Clerk of Court

PUBLISH

UNITED STATES COURT OF APPEALS

TENTH CIRCUIT

ATTORNEY GENERAL OF THE
STATE OF OKLAHOMA, State of
Oklahoma, ex rel. W.A. Drew
Edmondson, in his capacity as
Attorney General; OKLAHOMA
SECRETARY OF THE
ENVIRONMENT, ex rel. C. Miles
Tolbert in his capacity as the Trustee
for Natural Resources for the State of
Oklahoma,

Plaintiffs - Appellants,

v.

No. 08-5154

TYSON FOODS, INC.; TYSON
POULTRY, INC.; TYSON CHICKEN,
INC.; COBB-VANTRESS, INC.;
CAL-MAINE FOODS, INC.; CAL-
MAINE FARMS, INC.; CARGILL,
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PRODUCTION, LLC; GEORGE'S,
INC.; GEORGE'S FARMS, INC.;
PETERSON FARMS, INC.;
SIMMONS FOODS, INC.; WILLOW
BROOK FOODS, INC.,

Defendants - Appellees.

and

STATE OF ARKANSAS,

Amicus Curiae.

**APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA
(D.C. No. 05-CV-00329-GKF-SAJ)**

Frederick C. Baker of Motley, Rice, LLC (W.A. Drew Edmondson, Attorney General, Kelly H. Burch, J. Trevor Hammons, Daniel P. Lennington, Assistant Attorneys General for the State of Oklahoma, Oklahoma City, Oklahoma; M. David Riggs, Richard T. Garren, Robert A. Nance, and David P. Page of Riggs, Abney, Neal, Turpen, Orbison & Lewis, Tulsa, Oklahoma; Louis W. Bullock and Robert M. Blakemore of Bullock, Bullock & Blakemore, PLLC, Tulsa, Oklahoma, with him on the briefs), Mount Pleasant, South Carolina, for Plaintiffs - Appellants.

Jay T. Jorgensen of Sidley Austin LLP (Mark D. Hopson, Gordon D. Todd of Sidley Austin, LLP, Washington, DC; Robert W. George, Vice President & Associate General Counsel, Bryan Burns and Timothy T. Jones of Tyson Foods, Inc., Springdale, Arkansas; Michael R. Bond of Kutak Rock, LLP, Fayetteville, Arkansas; Patrick M. Ryan, Stephen L. Jantzen of Ryan, Whaley & Coldiron, PC, Oklahoma City, Oklahoma; Woodson W. Bassett III, Gary V. Weeks, James M. Graves, and K.C. Dupps Tucker of Bassett Law Firm, Fayetteville, Arkansas, Randall E. Rose and George W. Owens of Owens Law Firm, PC, Tulsa, Oklahoma; Robert P. Redemann of Perrine, McGivern, Redemann, Reid, Berry & Taylor, PLLC, Tulsa, Oklahoma; Robert E. Sanders and Stephen Williams of Young Williams PA, Jackson, Mississippi; R. Thomas Lay of Kerr, Irvine, Rhodes & Ables, Oklahoma City, Oklahoma; Jennifer S. Griffin of Lathrop & Gage, LC, Jefferson City, Missouri; John H. Tucker and Theresa Noble Hill of Rhodes, Hieronymus, Jones, Tucker & Gable, PLLC, Tulsa, Oklahoma; Delmar R. Ehrich, Bruce Jones, and Krisann C. Kleibacker Lee of Faegre & Benson, LLP, Minneapolis, Minnesota; John R. Elrod, Vicki Bronson, and P. Joshua Wisley of Conner & Winters, LLP, Fayetteville, Arkansas; Bruce W. Freeman and D. Richard Funk of Conner & Winters, LLP, Tulsa, Oklahoma; A. Scott McDaniel, Nicole M. Longwell, and Philip D. Hixon of McDaniel, Hixon, Longwell & Acord, PLLC, Tulsa, Oklahoma, with him on the brief) Washington, DC, for Defendants - Appellees.

Dustin McDaniel, Attorney General, Justin Allen, Chief Deputy Attorney General, Charles L. Moulton, Sr. Assistant Attorney General, and Kendra Akin Jones, Assistant Attorney General, Little Rock, Arkansas, filed an amicus curiae brief for the State of Arkansas, in support of Defendants - Appellees.

Before **KELLY, EBEL, and MURPHY**, Circuit Judges.

KELLY, Circuit Judge.

This is an interlocutory appeal of the district court's denial of a motion for a preliminary injunction. See Okla. ex rel. Edmondson v. Tyson Foods, Inc., No. 05-CV-329-GKF-SAJ, 2008 WL 4453098, at *1, *3 (N.D. Okla. Sept. 29, 2008). The motion arose out of a 2005 complaint filed by Plaintiffs-Appellants (collectively referred to as Oklahoma) against Defendants-Appellees (collectively referred to as Tyson Foods), which alleged various state and federal environmental claims. 1 Supp. App. at 1-35 (Complaint); II App. Doc. 2 (First Amended Complaint); 1 Supp. App. at 36-74 (Second Amended Complaint). Pursuant to that complaint, on November 14, 2007, Oklahoma filed its motion for a preliminary injunction under the Resource Conservation and Recovery Act (RCRA) of 1976, 42 U.S.C. § 6972(a)(1)(B), seeking to enjoin Tyson Foods from “(1) applying poultry waste to any land within the [Illinois River Watershed (IRW)] and (2) allowing the application of poultry waste generated at its respective poultry feeding operations and/or the respective poultry feeding operations under contract with it to any land within the IRW.” III App. Doc. 11, at 707. The district court denied a preliminary injunction on September 29, 2008, see Tyson Foods, Inc., 2008 WL 4453098, at *4, and this appeal followed. Our

jurisdiction arises under 28 U.S.C. § 1292(a)(1), and we affirm.

Background

The IRW, which encompasses approximately one million acres of land across Arkansas and Oklahoma, is home to hundreds of large-scale poultry farmers with which Tyson Foods contracts to obtain poultry for processing and marketing.¹ V App. Doc. 25, at 1384; VIII App. Doc. 42 (State’s Exhibit 427); 8 Supp. App. at 2503-07. Tyson Foods provides these farmers, also known as “growers,” with chicks, feed, and other support, while the farmers own and manage their own poultry-growing operations. 8 Supp. App. at 2505-08. The chicks are raised in poultry houses, which are floored with bedding materials, including wood shavings, rice hulls, and other organic substances. 1 Supp. App. at 225; 8 Supp. App. at 2507-08, 2605. The farmers then use the “poultry litter,” which includes the bedding materials and poultry feces, as fertilizer on their fields, and often sell or barter it to others. 8 Supp. App. at 2525-26, 2528-32, 2609.

Poultry litter contains the bacteria *E. coli*, *Salmonella*, and *Campylobacter*,

¹ The IRW hosts approximately 1,850 poultry houses. V App. Doc. 26, at 1700. A poultry house holds 20,000 to 25,000 birds at once, turning over an average of five to six times per year. *Id.* at 1697. According to Oklahoma, these houses generate approximately 345,000 tons of poultry waste per year. *Id.* at 1714; VIII App. Doc. 42 (State’s Exhibit 427).

all of which can cause a variety of ailments in humans, including death. V App. Doc. 25, at 1495; VI App. Doc. 27, at 1896, 1898; VII App. Doc. 29, at 2244-45, 2268; VIII App. Doc. 39, at 2922 (State's Exhibit 404). The IRW is a popular area for water recreation and supplies drinking water for residents in the area. V App. Doc. 25, at 1383-84; VI App. Doc. 27, at 1843-44, 1850-52. Oklahoma claims that the land application of poultry litter is a cause of fecal bacterial contamination of IRW waterways. Aplt. Br. 14. In support of this claim, Oklahoma argues that the nature of the soils, terrain, weather, and karst geology in the IRW region make it a ready transporter of poultry-litter bacteria into rivers, streams, and groundwater supplies. V App. Doc. 26, at 1621-31, 1634, 1640. Therefore, Oklahoma brought its motion in an effort to enjoin "land disposal" of Tyson Foods's poultry waste in the IRW. See Aplt. Br. 3.

In contrast, Tyson Foods claims that the bacteria in the area comes from myriad sources, including wildlife, various farm animals, and humans. 1 Supp. App. at 232-36; 7 Supp. App. at 2271-72, 2354-59; 8 Supp. App. at 2738-40. Tyson adds that the long-term layering of poultry litter in poultry houses for up to three years, the low rates of humidity in the poultry houses, the subsequent storage and drying of the litter, and its application to fields in a thin layer, thus exposing it to sunlight, results in the death of the bacteria contained within. 8 Supp. App. at 2605-10; see also VI App. Doc. 27, at 1891-92. Furthermore, Tyson claims that IRW bacteria levels do not correlate to poultry farming or litter

application, but rather correspond to areas of cattle farming and human activity.

2 Supp. App. at 670-73, 677-81; 8 Supp. App. at 2809-18.

Oklahoma brought its motion for a preliminary injunction under RCRA, which provides that

any person may commence a civil action on his own behalf—

...

(B) against any person, including the United States and any other governmental instrumentality or agency, to the extent permitted by the eleventh amendment to the Constitution, and including any past or present generator, past or present transporter, or past or present owner or operator of a treatment, storage, or disposal facility, who has contributed or is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which *may present an imminent and substantial endangerment to health or the environment.*

42 U.S.C. § 6972(a)(1)(B) (emphasis added). To support its arguments,

Oklahoma presented various experts to testify to the bacterial contamination resulting from the use of poultry litter as fertilizer.

Particularly relevant to this appeal are experts Dr. Valerie Harwood and Dr. Roger Olsen. Dr. Harwood holds a Ph.D. in biomedical sciences and is a tenured associate professor at the University of South Florida. VI App. Doc. 27, at 1883-84. She testified to her use of a polymerase chain reaction (PCR) methodology, which she claims allowed her to identify poultry litter DNA in the IRW soil and waters. *Id.* at 1902-30. Dr. Olsen holds a Ph.D. in geochemistry and works for Camp, Dresser, McKee (known as CDM), an engineering, construction, and consulting company. *Id.* at 2029-30. He testified to his use of the principal

component analysis (PCA) methodology to show excessive bacterial presence in the IRW. Id. at 2035-57. Based on this testimony and that of other witnesses, Oklahoma argues that poultry litter is a substantial cause of the IRW's allegedly dangerous bacterial contamination levels. Aplt. Br. 19.

After conducting eight days of evidentiary hearings, receiving testimony from numerous witnesses, and reviewing hundreds of exhibits, the district court concluded that Oklahoma failed to demonstrate that "bacteria in the waters of the IRW are caused by the application of poultry litter rather than by other sources, including cattle manure and human septic systems." Tyson Foods, Inc., 2008 WL 4453098, at *1, *3. As a result, Oklahoma failed to meet the heightened standard (as modified by RCRA) required for a mandatory injunction, which this court set forth in O Centro Espirita Beneficente Uniao Do Vegetal v. Ashcroft, 389 F.3d 973, 975-76 (10th Cir. 2004) (en banc) (per curiam), aff'd and remanded, 546 U.S. 418 (2006). See Tyson Foods, Inc., 2008 WL 4453098, at *1, *3. The district court further held that the expert testimony of Drs. Harwood and Olsen was not sufficiently reliable under the standards set forth in Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993). See Tyson Foods, Inc., 2008 WL 4453098, at *3-4. The court therefore declined to accord their testimony the weight required to establish a link between the poultry litter and the IRW's bacteria levels. Id. at *4.

On appeal, Oklahoma asserts that the district court erred in denying the

motion for a preliminary injunction for three reasons: (1) in failing to apply the liability standard set forth in RCRA to determine whether Oklahoma was entitled to a preliminary injunction; (2) in concluding that the opinions of two expert witnesses were not sufficiently reliable under Daubert; and (3) in failing to state findings of fact and conclusions of law to support its refusal to grant the motion as required under Federal Rule of Civil Procedure 52(a).

Discussion

We review the denial of a preliminary injunction under an abuse of discretion standard. Gen. Motors Corp. v. Urban Gorilla, LLC, 500 F.3d 1222, 1226 (10th Cir. 2007) (citing Wyandotte Nation v. Sebelius, 443 F.3d 1247, 1252 (10th Cir. 2006)); O Centro Espirita Beneficente Uniao Do Vegetal v. Ashcroft, 342 F.3d 1170, 1176-77 (10th Cir. 2003), affirmed en banc, 389 F.3d 973, aff'd and remanded, 546 U.S. 418. An abuse of discretion occurs when the district court “commits an error of law or makes clearly erroneous factual findings.” Gen. Motors Corp., 500 F.3d at 1226 (quoting Wyandotte Nation, 443 F.3d at 1252). We have previously characterized an abuse of discretion as “‘an arbitrary, capricious, whimsical, or manifestly unreasonable judgment.’” RoDa Drilling Co. v. Siegal, 552 F.3d 1203, 1208 (10th Cir. 2009) (quoting Winnebago Tribe of Neb. v. Stovall, 341 F.3d 1202, 1205-06 (10th Cir. 2003)). Our review of a district court’s exercise of discretion is narrow, and we consider the merits of the

case only as they affect that exercise of discretion. Gen. Motors Corp., 500 F.3d at 1226. We note that in the course of our review for abuse of discretion, we examine the district court’s legal determinations de novo, and its underlying factual findings for clear error. Davis v. Mineta, 302 F.3d 1104, 1111 (10th Cir. 2002).

In affirming the district court’s denial of a preliminary injunction, we do not address the underlying merits of Oklahoma’s ultimate claims at trial. Because preliminary injunctions are “customarily granted on the basis of procedures that are less formal and evidence that is less complete than in a trial on the merits,” we do not require a moving party to “prove his case in full at a preliminary-injunction hearing” Univ. of Tex. v. Camenisch, 451 U.S. 390, 395 (1981). Thus, “the findings of fact and conclusions of law made by a court granting a preliminary injunction are not binding at trial on the merits.” Id.; NLRB v. Acker Indus., Inc., 460 F.2d 649, 652 (10th Cir. 1972); 11A Charles Alan Wright, Arthur R. Miller & Mary Kay Kane, Federal Practice and Procedure § 2950 (2d ed. 1995); see also Fed. R. Civ. P. 65(a) (indicating that evidence presented at a preliminary injunction hearing need not be repeated at trial).

I. Preliminary Injunction Standard

To obtain a preliminary injunction, the moving party must demonstrate: “(1) a likelihood of success on the merits; (2) a likelihood that the movant will suffer irreparable harm in the absence of preliminary relief; (3) that the balance of

equities tips in the movant's favor; and (4) that the injunction is in the public interest." RoDa, 552 F.3d at 1208 (citing Winter v. Natural Res. Def. Council, Inc., 129 S.Ct. 365, 374 (2008)). We consider a preliminary injunction to be an extraordinary remedy, and caution courts against granting injunctions that alter the status quo or that require the "nonmoving party to take affirmative action—a mandatory preliminary injunction—before a trial on the merits occurs." Id. (citing O Centro, 389 F.3d at 977); see also Winter, 129 S.Ct. at 376; Gen. Motors Corp., 500 F.3d at 1226. Because mandatory preliminary injunctions are disfavored, before a district court may grant such relief, the movant must make a heightened showing of the above four factors. RoDa, 552 F.3d at 1208-09; see also O Centro, 389 F.3d at 977. By requiring this heightened showing, "our aim is to minimize any injury that would not have occurred but for the court's intervention." RoDa, 552 F.3d at 1209.

In RCRA, Congress envisioned a federal-state partnership, wherein states would develop solid waste management plans in an effort to minimize the needless disposal of recoverable waste and ensure the environmentally friendly disposal of nonrecoverable residues. 42 U.S.C. § 6902. As an enforcement measure, RCRA's citizen suit provision permits suit against any person "who has contributed or who is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid . . . waste which may present an imminent and substantial endangerment to health or the environment." 42 U.S.C.

§ 6972(a)(1)(B). Because of this provision, Oklahoma was required to show under the first of the preliminary injunction factors that it had a likelihood of success of establishing at trial that the land application of poultry litter “may present” an imminent and substantial endangerment to those who rely on and recreate in the IRW.

The court denied Oklahoma’s motion for preliminary injunction after discussing the heightened standard required for granting a mandatory injunction and its intent to weigh heavily the public’s interest in the issuance of the injunction. Tyson Foods, Inc., 2008 WL 4453098, at *1-3. In so doing, the court held that “[t]he State has not yet met its burden of proving that bacteria in the waters of the IRW are caused by the application of poultry litter rather than by other sources,” id. at *1, and that “the State has failed to meet the applicable standard of showing that the bacteria levels in the IRW can be traced to the application of poultry litter,” id. at *4. Essentially, the court denied the injunction as a result of Oklahoma’s failure to establish a causal link between the land application of poultry litter and bacteria in the IRW. As a result of this failure, Oklahoma could not demonstrate that it had a likelihood of succeeding on the merits of its claim that the land application of poultry litter “may present” an imminent and substantial danger, as required by RCRA.

On appeal, Oklahoma argues that the district court erred in failing to apply RCRA’s liability standard, as set forth in 42 U.S.C. § 6972(a)(1)(B), to establish

its entitlement to a preliminary injunction. While the district court did not explicitly discuss RCRA's "may present" language, this did not result in the application of an incorrect legal standard. Our prior case law indicates that under RCRA a plaintiff need not "show proof of actual harm to health or the environment" to establish endangerment, but rather injunctive relief is appropriate where there simply *may* be a risk of harm. Burlington N. and Santa Fe Ry. Co. v. Grant, 505 F.3d 1013, 1020 (10th Cir. 2007). However, given the district court's view of the evidence, Oklahoma failed to link land-applied poultry litter and the bacteria in the IRW, so it could not meet even this low hurdle. Oklahoma's inability to make this necessary evidentiary link meant that it could not establish that poultry litter may be a risk of harm in the IRW waterways. The district court's opinion amply indicates that it recognized this gap.²

² We discussed at length the RCRA standard for liability in Burlington Northern, 505 F.3d at 1019-21. While we reversed a grant of summary judgment in that case, here we deal with factual findings made by the district court after extensive hearings. The dissent argues that the district court employed the wrong legal standard to its factual findings and required Oklahoma to prove actual causation of harm. However, under our deferential standard of review, we are reluctant to presume that the district court failed to evaluate the evidence in light of an applicable legal standard. See Sprint/United Mgmt. Co. v. Mendelsohn, 128 S. Ct. 1140, 1146 (2008). The district court's factual findings are completely incompatible with granting a mandatory injunction on the theory of potential endangerment. The dissent's suggestion that we remand for clarification would simply ask the district court to restate in more precise language exactly what it has already said: "the State has failed to meet the applicable standard of showing that the bacteria levels in the IRW can be traced to the application of poultry litter." Tyson Foods, Inc., 2008 WL 4453098, at *4. In so finding, the district court made a choice between two permissible views of the evidence, and it is not our role to label this choice clearly erroneous. Anderson v. City of Bessemer

There is sufficient record evidence to support the district court's resolution of this issue. First, it is undisputed that humans, various wildlife, and numerous farm animals, including pigs, sheep, and cattle, rely on IRW lands and waterways, and harbor the various bacteria at issue in this case. 7 Supp. App. 2271-72, 2354-59; 8 Supp. App. 2602-04, 2738-42. Although Oklahoma attempted, through its expert witnesses, to establish that poultry litter was a contributing source of the IRW bacteria, it did not account for these alternative sources of bacteria. 2 Supp. App. 670; 3 Supp. App. 889-90; 7 Supp. App. 2341-42, 2354-59, 2437-38; 8 Supp. App. 2622-26, 2670-78, 2736-42. This omission clearly left the district court with doubt about the potential ameliorating effects of a preliminary injunction. See, e.g., Burlington N. and Santa Fe Ry. Co., 505 F.3d at 1021 (indicating that relief may be in order where "there is reasonable cause for concern that someone . . . may be exposed to risk of harm . . . in the event remedial action is not taken").

Second, the parties presented evidence on methods of storage and land application of poultry litter, which facilitate the death of bacteria contained within, leaving further doubt about poultry litter's contribution to the IRW's bacteria level. VI App. Doc. 27, at 1891-92; 7 Supp. App. 2320-21; 8 Supp. App. 2605-10, 2731-32. Additionally, the record indicates that the land-application of poultry litter is a well-established farming practice. See 1 Supp. App. 273-74, City, 470 U.S. 564, 574 (1985).

277-78; 8 Supp. App. 2520-21, 2525; see also Amicus Br. 12-15. That this practice is commonplace and that Dr. Harwood stated that Oklahoma did not identify any humans who have become ill from drinking IRW water contaminated by poultry litter further weakens Oklahoma's position. 2 Supp. App. 467-68.

Third, Oklahoma failed to conduct a fate and transport study to establish that any surviving bacteria from poultry litter actually reached the waters of the IRW. 4 Supp. App. 1137, 1190-91, 1197-98; 7 Supp. App. 2340-42; 8 Supp. App. 2681-84, 2719-24. Moreover, IRW bacteria levels appear not to differ from bacteria levels in other bodies of water throughout Oklahoma, even where poultry farming is less common. 8 Supp. App. 2809-18.

These points, as well as our review of the lengthy record in this case, establish that the district court did not abuse its discretion in denying the motion for a preliminary injunction. Oklahoma's inability to link land-applied poultry litter to the bacteria in the IRW precludes a finding that such litter may present an imminent and substantial endangerment, as required under RCRA's liability standard. This failure to satisfy the forgiving RCRA standard results in Oklahoma's inability to demonstrate its likelihood of success on the merits, the first factor required for preliminary injunctive relief.

In conjunction with its argument that the district court applied the wrong legal standard, Oklahoma further claims that the district court formulated a new "sole cause" standard, which improperly required Oklahoma to establish that

poultry waste was the only cause of IRW bacteria. Aplt. Br. 33-37. The district court's opinion does not contain such an error. Rather, the district court held that Oklahoma could not establish that poultry litter was a contributing cause of the bacteria at all:

The evidence produced to this Court reflects that fecal bacteria in the waters of the IRW come from a number of sources, including cattle manure and human waste from growing numbers of human septic systems in that area's karst topography. The record reflects levels of fecal bacteria at similar levels in rivers and streams throughout the State of Oklahoma, including waterways in whose watersheds the record does not evidence similar application of poultry waste. At this juncture in the action, the State has failed to meet the applicable standard of showing that the bacteria levels in the IRW can be traced to the application of poultry litter.

See Tyson Foods, Inc., 2008 WL 4453098, at *4. In other words, the district court found that the bacteria in the IRW might be caused by any number of contributors, and that Oklahoma, by failing to account for alternative bacterial contributors, had failed to establish that poultry litter was *one* of those sources. Nowhere does the district court say that poultry litter must be the *only* contributing source. Thus, we find no abuse of discretion.

II. Expert Testimony

Underpinning the district court's conclusion that Oklahoma failed to establish a link between poultry litter and IRW bacteria is its finding that the expert testimony of Drs. Harwood and Olsen was "not sufficiently reliable." Id. On appeal, Oklahoma argues that the court incorrectly relied on Daubert to

conclude that the experts' methodologies were improperly applied, and thus that their conclusions were unreliable. Essentially, Oklahoma claims that Daubert should not have been used to assess the *application* of the experts' methodologies, but rather should have been used to assess *only the methodologies* upon which the doctors relied.

The trial court retains broad discretion in assessing an expert's reliability and making its ultimate determination of reliability. Goebel v. Denver and Rio Grande W. R.R. Co., 346 F.3d 987, 990 (10th Cir. 2003); see also Kumho Tire Co. v. Carmichael, 526 U.S. 137, 142 (1999). We will not disturb a trial court's decision to exclude evidence absent an abuse of discretion, meaning that we have a "definite and firm conviction that the trial court has made a clear error of judgment or exceeded the bounds of permissible choice." Ralston v. Smith & Nephew Richards, Inc., 275 F.3d 965, 968-69 (10th Cir. 2001) (quoting Beaird v. Seagate Tech., Inc., 145 F.3d 1159, 1164 (10th Cir. 1998)) (brackets omitted). Furthermore, while Daubert's standards must still be met, the usual concerns regarding unreliable expert testimony reaching a jury obviously do not arise when a district court is conducting a bench trial. Seaboard Lumber Co. v. United States, 308 F.3d 1283, 1302 (Fed. Cir. 2002). Thus, the "scope of our review is quite narrow." Hollander v. Sandoz Pharm. Corp., 289 F.3d 1193, 1206 (10th Cir. 2002).

In Daubert, the Supreme Court set forth the standard for admitting

scientific evidence pursuant to Federal Rule of Evidence 702. Primarily, a trial judge's decision to admit or exclude scientific testimony rests on a determination of whether that testimony is relevant and reliable. Daubert, 509 U.S. at 589.

“This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.” Id. at 592-93. The standard for admissibility is a flexible one, but the Court set forth a number of factors to consider in making such a determination. Those factors include whether the theory or technique has been tested, subjected to peer review, and published, as well as its known rate of error—essentially that the methodology is scientifically sound. Id. at 593-95; see also Dodge v. Cotter Corp., 328 F.3d 1212, 1222 (10th Cir. 2003). “The focus, of course, must be solely on principles and methodology, not on the conclusions they generate.” Daubert, 509 U.S. at 595.

However, as the Supreme Court discussed in General Electric Co. v. Joiner, “conclusions and methodology are not entirely distinct from one another.” 522 U.S. 136, 146 (1997). It is an elusive process to divine the difference between a methodology and what constitutes a change from that methodology; therefore, under Daubert, we simply hold that “any step that renders the analysis unreliable renders the expert's testimony inadmissible. This is true whether the step completely changes a reliable methodology or merely misapplies that

methodology.’” Mitchell v. Gencorp Inc., 165 F.3d 778, 782 (10th Cir. 1999) (quoting In re Paoli R.R. Yard PCB Litig., 35 F.3d 717, 745 (3d Cir. 1994) (emphasis omitted)).

In making its determination here, the district court admitted all proffered expert testimony, denying Tyson Foods’s motions to exclude. 7 Supp. App. 2329-30, 2465-66. Subsequently, the court relied on Daubert to govern the weight accorded to that evidence. Tyson Foods, Inc., 2008 WL 4453098, at *4. In its opinion and order, the court took issue with the fact that the experts’ work had not been peer reviewed or published, and that “no one outside this lawsuit . . . has either validated or sought to validate [the experts’] scientific work.” Id. at *4. Thus, the court held the experts’ testimony and conclusions to be insufficiently reliable. Id.

While Oklahoma argues that the district court committed a “legal impossibility” in both admitting the testimony and subsequently finding it unreliable, Aplt. Br. 45, we find no abuse of discretion in the court’s determination. As discussed above, a judge conducting a bench trial maintains greater leeway in admitting questionable evidence, weighing its persuasive value upon presentation. Moreover, when experts apply methodologies in novel ways, they may arrive at conclusions that result in “too great an analytical gap between the data and the opinion proffered” to be determined reliable. Hollander, 289 F.3d at 1205 (quoting Joiner, 522 U.S. at 147). In other words, as Tyson Foods

argues, when experts employ established methods in their usual manner, a district court need not take issue under Daubert; however, where established methods are employed in new ways, a district court may require further indications of reliability. See Aple. Br. 36 n.18.

Dr. Harwood testified to her use of microbial source tracking (MST) to identify a DNA biomarker specific to poultry litter bacteria. VI App. Doc. 27, at 1887, 1902-04; 7 Supp. App. 2360-92. Specifically, she used a polymerase chain reaction (PCR) to replicate the bacteria's DNA, a process that would allow her to identify whether such bacteria were present in various environmental samples. VI App. Doc. 27, at 1902-04; 7 Supp. App. 2324-25, 2326-28. The process relies on the identification and development of poultry-litter-specific DNA fragments, or "primers." 7 Supp. App. 2330-31. The case law indicates that the courts are not unfamiliar with the PCR methodology, and in fact some courts have indicated their acceptance of it. See, e.g., United States v. Trala, 386 F.3d 536, 541 (3d Cir. 2004), rev'd on other grounds, 546 U.S. 1086 (2006) (citing United States v. Trala, 162 F. Supp. 2d 336, 347 (D. Del. 2001) (holding that PCR evidence is acceptable where FBI maintains an extensive protocol on its application in context of criminal DNA identification)); United States v. Boswell, 270 F.3d 1200, 1205 (8th Cir. 2001) (admitting PCR evidence in the context of swine blood, and indicating that "deficiencies [in the PCR procedure] go to the weight to be given the DNA evidence, not its admissibility"); United States v. Beasley,

102 F.3d 1440, 1448 (8th Cir. 1996) (indicating that PCR methodology is “sufficiently well established,” but also that a sound methodology may be undercut for various reasons); see also Stills v. Dorsey, 7 F. App’x 856, 859 (10th Cir. 2007) (unpublished) (indicating that “objections to the reliability of the PCR analysis go to the weight of the evidence rather than its admissibility”).

The district court’s objection to Dr. Harwood’s PCR methodology, however, arises out of the novelty of its application to an entirely new area, which required the development of primers that had not been identified previously. Thus, the court looked to other indications of reliability, including those enumerated by the Daubert Court, but could find none. The record indicates that Dr. Harwood’s method was “novel and untested.” 8 Supp. App. 2745, 2746-53. In fact, Dr. Harwood herself indicated as much. 7 Supp. App. 2325-26, 2372-76. Moreover, Dr. Harwood’s application of PCR in this area has not been published or peer reviewed. 7 Supp. App. 2333, 2389-90; 8 Supp. App. 2745. In addition, the record casts further doubt on Dr. Harwood’s methodology, suggesting other procedural flaws. See, e.g., 7 Supp. App. 2357-59, 2379-83, 2396; 8 Supp. App. 2754. For all of these reasons, and based on our review of the record, we do not find that the district court abused its discretion in according Dr. Harwood’s testimony scant weight.

The same can be said about Dr. Olsen’s expert testimony. Dr. Olsen relied on principal component analysis (PCA) to identify poultry litter’s “signature”

composition (consisting of various metals, chemicals, and bacteria). VI App. Doc. 27, at 2035-36, 2041-52, 2061-63; 3 Supp. App. 813-16; 7 Supp. App. 2427-32, 2435. By using PCA, he claimed to identify poultry litter contamination in the IRW, although he could not trace direct sources of the litter. 3 Supp. App. 814-15. PCA is a statistical method of analyzing data; essentially, it uses a series of equations to identify patterns common to a large data set. VI App. Doc. 27, at 2068-73; 3 Supp. App. 861-63; 7 Supp. App. 2415, 2427-28. As a result, Dr. Olsen was required to make discretionary decisions about which data he would enter into his calculations. VI App. Doc. 27, at 2065-66; 7 Supp. App. 2415, 2427, 2431-32. The discretionary decisions in his methodology had not been tested or peer reviewed, nor did his procedure account for alternative sources of the poultry-litter components. 7 Supp. App. 2432-41; 8 Supp. App. 2646-47. In addition, further doubts were raised regarding Dr. Olsen's sampling procedures and possible flaws in the data presented. See, e.g., 7 Supp. App. 2415-21, 2443-45, 2448-51, 2456-59. Again, based on our review of the record, we do not find that the district court abused its discretion in discounting Dr. Olsen's procedures as insufficiently reliable, and thus concluding that Oklahoma did not link poultry litter with the IRW's bacteria levels at this stage of the litigation.

III. Federal Rule of Civil Procedure 52(a)(2)

Additionally, Oklahoma argues that the district court failed to state the findings and conclusions it relied upon in denying the preliminary injunction, as

required under Federal Rule of Civil Procedure 52(a)(2). Repeating its argument that RCRA supplies the appropriate standard for assessing legal liability, Oklahoma objects to the district court's conclusions that it was not entitled to a preliminary injunction because (1) fecal matter in the IRW comes from a variety of sources, and (2) that waters unaffected by poultry litter application outside the IRW are also polluted by fecal bacteria.

Federal Rule of Civil Procedure 52(a) states that, “[i]n an action tried on the facts without a jury or with an advisory jury, the court must find the facts specially and state its conclusions of law separately.” The Rule further states that “[t]he findings and conclusions . . . may appear in an opinion or a memorandum of decision filed by the court.” Fed. R. Civ. P. 52(a). The requirements are the same for interlocutory injunctions. See Fed. R. Civ. P. 52(a)(2). The rule aims to give reviewing courts “a clear understanding of the process by which [the district court’s] ultimate conclusions were reached.” Prairie Band of Potawatomi Indians v. Pierce, 253 F.3d 1234, 1245-46 (10th Cir. 2001); see also Mayo v. Lakeland Highlands Canning Co., 309 U.S. 310, 316 (1940). In sum, a district court must sufficiently indicate the factual basis for its conclusions as to ultimate facts, indicate the legal standard against which it has measured the evidence, and broadly cover all material issues. OCI Wyo., L.P. v. PacifiCorp, 479 F.3d 1199, 1203 (10th Cir. 2007). We have previously held that there is no need for “excruciating detail” under the Rule. Id. at 1204. Furthermore, inadequate

findings of fact constitute harmless error if a reviewing court “can ascertain from the record that one party or the other was clearly entitled to judgment in its favor,” or if there is no danger of confusion about the basis of the decision, the record supports the court’s order, and the record indicates the court heard evidence on each element. Potawatomi Indians, 253 F.3d at 1246.

In its opinion and order denying a preliminary injunction, the district court stated that “the State has not yet met its burden of proving that bacteria in the waters of the IRW are caused by the application of poultry litter rather than by other sources As a result, the State has failed to meet the heightened standard for a preliminary injunction” Tyson Foods, Inc., 2008 WL 4453098, at *1. The district court set out the standard for granting a preliminary injunction, determined that the requested injunction required a heightened showing of the four factors, and then indicated that it did not find Oklahoma’s two expert witnesses on the source of bacterial pollutants in the IRW to be sufficiently credible. Id. at *2-4. Therefore, the court held, Oklahoma could not establish causation, and thus by implication Oklahoma could not establish a likelihood of success on the merits of its RCRA claim.

We certainly agree that the district court’s order could have been more explicit, but the grounds for the district court’s decision are sufficiently apparent to allow us to conduct appellate review, namely, it allows us to determine (1) the legal standards employed, (2) whether the findings have sufficient evidentiary

support, (3) whether the legal conclusions follow from those findings, and (4) whether the legal conclusions support the grant or denial of relief. Thus, even if this court did find that the district court failed to comply with Federal Rule of Civil Procedure 52(a), the error would be harmless and a remand for clarification would not be necessary because we can ascertain from the record the basis for the denial. Potawatomi Indians, 253 F.3d at 1246 (citing Anthony v. Texaco, Inc., 803 F.2d 593, 600 (10th Cir. 1986)). The district court, based on the evidence presented, simply could not establish a sufficient link between land-applied poultry litter and bacteria in the IRW, and therefore preliminary injunctive relief was not appropriate.

AFFIRMED. All pending motions are DENIED.

08-5154, Attorney General of the State of Oklahoma, et al. v. Tyson Foods, et al.

EBEL, J., concurring in part and dissenting in part.

I join Part II of the majority opinion. I respectfully dissent from Parts I and III, for two reasons. First, I believe the district court failed to apply the correct legal standard in evaluating Oklahoma’s likelihood of success on the merits under RCRA’s citizen-suit provision, 42 U.S.C. § 6972(a)(1)(B). Second, I believe that the district court also failed to meet its obligation, under Fed. R. Civ. P. 52(a), of making findings of facts and conclusions of law as to all material issues at stake in its determination of that likelihood of success.

I. Injunctions under RCRA’s citizen-suit provision

In order to prevail on its motion for preliminary injunction under RCRA’s citizen-suit provision, Oklahoma must establish that the Poultry Integrators “[have] contributed or . . . [are] contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment.” 42 U.S.C. § 6972(a)(1)(B) (emphasis added).

In Burlington Northern and Santa Fe Railway Company v. Grant, 505 F.3d 1013 (10th Cir. 2007), this court explained that “[a]s a threshold matter, it is well established that the operative word in § 6972(a)(1)(B)[’s ‘may present an imminent and substantial endangerment’ clause] is ‘may’; thus, [the plaintiff] must demonstrate that the [solid or hazardous waste] ‘may present’ such a

danger.” 505 F.3d at 1020. Adopting the language of the Second Circuit, we emphasized that “[t]his ‘expansive language’ is ‘intended to confer upon the courts the authority to grant affirmative equitable relief to the extent necessary to eliminate any risk posed by toxic wastes.’” Id. (quoting Dague v. City of Burlington, 935 F.2d 1343, 1355 (2d Cir. 1991), rev’d in part on other grounds, 502 U.S. 1071 (1992)).

Furthermore, we explained in Burlington Northern, “the term ‘endangerment’ has been interpreted by courts to mean a threatened or potential harm[;] thus, it is not necessary that [the plaintiff] show proof of actual harm to health or the environment.” Id. (emphasis added). Instead, “injunctive relief is authorized when there may be a risk of harm.” Id. Similarly, a court’s “finding of ‘imminency’ does not require a showing that actual harm will occur immediately as long as the risk of threatened harm is present.” Id. Rather, the key is that the threat itself is present now, even if the impact of that threat “may not be felt until later.” Id. (quoting Meghrig v. KFC Western, Inc., 516 U.S. 479, 485-86 (1996)). “[A]n endangerment is substantial where there is reasonable cause for concern that someone or something may be exposed to risk of harm by release, or threatened release, of hazardous substances in the event remedial action is not taken.” Id. at 1021 (emphasis added). And in applying this endangerment standard, courts should err on the side of “protecting public health, welfare and the environment.” Id. (quotation omitted).

II. The district court's opinion and order

The majority opinion interprets the district court's opinion and order as having decided Oklahoma's motion on the likelihood-of-success-on-the-merits prong of the preliminary injunction standard. (Maj. op. at 10-12.) If that interpretation is correct, the district court was obligated, under Rule 52(a), to make findings of fact "broad enough to cover all material issues" at stake in a consideration of Oklahoma's likelihood of succeeding on the merits of its RCRA citizen-suit claim. OCI Wyo., L.P. v. Pacificorp, 479 F.3d 1199, 1203 (10th Cir. 2007) (quotation omitted). And as we made clear in Burlington Northern, success on the merits under § 6972(a)(1)(B) requires not "proof of actual harm to health or the environment," but rather a demonstration that "there may be a risk of harm." 505 F.3d at 1020.

Despite this clear mandate as to the standard for success on the merits under RCRA's citizen-suit provision, and as the majority opinion recognizes, the district court instead applied to its brief factual findings a legal standard requiring proof of actual causation of harm: "The State has not yet met its burden of proving that bacteria in the waters of the IRW are caused by the application of poultry litter," and "[a]t this junction in the action, the State has failed to meet the applicable standard of showing that the bacteria levels in the IRW can be traced to the application of poultry litter." (Dist. ct. op. at 1, 7 (emphasis added); see Maj. op. at 11-12.)

The district court correctly held that because Oklahoma was seeking a traditionally disfavored injunction, the State was required to make a heightened showing of the four preliminary injunction factors. (Dist. ct. op. at 3-5, citing O Centro Espirita Beneficiente Uniao Do Vegetal v. Ashcroft, 389 F.3d 973, 975 (10th Cir. 2004) (en banc) (per curiam).) Yet a heightened showing of RCRA’s requirement that “there may be a risk of harm” from a defendant’s conduct, Burlington Northern, 505 F.3d at 1020, is simply not tantamount to a showing of something entirely different—namely, that a defendant’s conduct has caused such harm.¹

III. Oklahoma’s pleadings and evidence as to risk of harm

Had Oklahoma pled and attempted to prove only actual harm, rather than risk of harm, from the land application of poultry litter, I would conclude that despite RCRA’s and Burlington Northern’s explicit language, the district court was correct in holding the State to its claims (and thus in testing those claims by an actual-causation standard). However, the record makes clear that in both the

¹I note that if the RCRA standard were, instead, one of actual causation—of extant, consummated harm produced by solid or hazardous waste—I would agree with the majority’s conclusion that Oklahoma failed to demonstrate a likelihood of success on the merits. Once we properly discount the testimony of the two discredited expert witnesses, Drs. Harwood and Olsen, there is no credible evidence in the record that would demonstrate, under the heightened scrutiny standard of O Centro, that bacteria from the land application of poultry litter has contaminated the waters of the IRW. Because § 6972(a)(1)(B)’s standard is risk of harm rather than actual harm, however, “Oklahoma’s failure to establish a causal link between the land application of poultry litter and bacteria in the IRW” (Maj. op. at 11) is not dispositive of its likelihood of success on the merits.

complaint and in the motion for preliminary injunction, Oklahoma correctly asserted § 6972(a)(1)(B)'s endangerment standard and argued that the land application of poultry litter put the waters of the IRW—and the people who use those waters—at risk of harm. Furthermore, the record includes ample evidence to show that during the hearing before the district court, Oklahoma introduced credible testimony tending to show plausible pathways by which the constituents of land-applied poultry litter, including bacteria, could reach both the surface waters and the groundwater of the IRW, thus putting those waters at risk of contamination.

A. *Oklahoma's pleadings*

In the Second Amended Complaint, Oklahoma alleged that the Poultry Integrators' land application of poultry litter constituted both a known risk to the waters of the IRW and a known cause of harm to those waters:

In sum, each of the Poultry Integrator Defendants has long known that such poultry waste disposal practices [i.e., land application of poultry litter] present the threat that constituents of poultry waste will run off and be released into and from the land to which the poultry waste is applied[,] thereby potentially adversely impacting the IRW, including the biota, lands, waters and sediments therein, and that such practices have in fact resulted in constituents of poultry waste running off and being released into and from the land to which the poultry waste is applied[,] thereby adversely impacting the IRW, including the biota, lands, waters and sediments therein.

(Aple. Supp. App. vol. 1 at 50-51, ¶ 56 (emphasis added).) Likewise, Oklahoma alleged, the Poultry Integrators have “long known that poultry waste contains a

number of constituents that can and do cause harm to the environment and pose human health hazards.” (*Id.* at 51, ¶ 57.) Those constituents were then alleged to include pathogenic bacteria. (*Id.* at 51, 52, ¶ ¶ 57(g), 63.)

The State went on to allege that “in a recent open letter published to the citizens of Oklahoma,” certain of the defendants “admitted that their poultry waste ‘potentially impact[s] the health of the rivers and streams’” within Oklahoma’s scenic watersheds. (*Id.* at 53, ¶ 65 (emphasis added).) Finally, in laying out its cause of action under RCRA’s citizen-suit provision, Oklahoma alleged that “[a]n imminent and substantial endangerment to health or the environment may be presented and is in fact presented as a direct and proximate result of each of the Poultry Integrator Defendants’ respective contribution to the handling, storage, treatment, transportation or disposal of poultry waste in the IRW and lands and waters therein.” (*Id.* at 59, ¶ 94.) The State requested that the defendants be enjoined “to take all such . . . action as may be necessary to abate the imminent and substantial endangerment to health or the environment.” (*Id.* at ¶ 95.)

In its Motion for Preliminary Injunction and Integrated Brief in Support Thereof, Oklahoma argued that “[b]oth the surface water and the groundwater of the IRW are highly susceptible to pollution from land application of animal waste because of the terrain and the geology of th[e] area.” (Aplt. App. vol. III at 701.) The risk of pollution to the IRW’s waters, according to Oklahoma, arises from the

region's karst terrain, which "allows for ready transport of land applied poultry waste, including the fecal bacteria in this waste, into the surface water and the groundwater in the IRW." (Id.) These fecal bacteria, the State argued, "present[] an imminent and substantial endangerment to human health," as they may cause a number of infectious diseases. (Id. at 703-06.)

In support of this theory of endangerment, Oklahoma quoted from Defendant Peterson Farms's Poultry Water Quality Handbook:

Animal waste is a potential source of some 150 disease-causing organisms or pathogens. . . . When found in water or wastes, these pathogens pose significant threats to humans and other animals through drinking water, contact with the skin, or consumption of fish or other aquatic animals. Most pathogens die relatively quickly. However, under the right conditions, they may live long enough to cause problems. They persist longer in groundwater than in surface water.

(Id. at 706 n.6.) The State went on to quote extensively from this court's explication, in Burlington Northern, of RCRA's citizen-suit standard for demonstrating that solid or hazardous waste "may present an imminent and substantial endangerment to health or the environment." (Id. at 714-16.)

Oklahoma argued that it had satisfied the RCRA standard by demonstrating "that an imminent and substantial endangerment to human health or the environment may be presented, and in fact is presented, by [the land application of] poultry waste." (Id. at 717.)

B. *Testimony at the hearing on Oklahoma's motion*

After arguing in its pleadings that the land application of poultry waste may present a risk to the waters of the IRW, Oklahoma offered, at the hearing on its motion for preliminary injunction, credible testimony tending to establish plausible pathways by which poultry litter constituents, including pathogenic bacteria, could reach those waters. Most notably, Dr. John Fisher testified at length about the pathways created by the region's karst geology. (Aplt. App. vol. V at 1621-35.) Explaining a geologic map of the IRW, Dr. Fisher testified as follows:

[Fisher:] This shows the outlying boundary of the Illinois River Watershed. The bold black lines indicate major map faults. . . . [T]hese are major breaks in the rocks that comprise the bedrock here. . . .

. . . .

. . . In this kind of terrain, we're sitting here in what's called the Springfield Plateau. It's part of the Ozark uplift, an uplifted feature in Arkansas. It's a dome. The dome spills and dips off to the west. It's why the rivers sort of run in a circle around the edge here in Oklahoma. It's why the Arkansas runs the way it does because it's running around the edge of that. The structural development of that dome, plus subsequent structural crustal deformations take place after all the bedrock that's here in this watershed has been deposited. And so what that means is all these fractures can penetrate every bedrock unit that's present because the fracturing happened after the bedrock was made.

So if you wanted to sort of paint a brush over this, this place is broken like a cup. The drainage features within this watershed are generally structurally determined. They're flowing along zones of crustal weakness, along fractures. . . . We have a structurally

modified bedrock that's controlling the terrain.

[Question from Plaintiff's counsel:] What's the effect of all this fracturing and the faulting that you are describing that's in this watershed as it pertains to the land spreading of poultry waste?

[Fisher:] Even with kinds of rocks that aren't soluble like a granite, this would provide a conduit for waste deposited on the surface and [its] constituents to move directly into groundwater. The bedrock that's present here in the near surface is the Boone limestone and the Saint Joe limestone, which are both soluble. So this fracturing combined with the soluble nature of those rocks mean[s] these fractures become enlarged by dissolution. And so these become very, very good pathways for wastes that are present on the surface to enter the subsurface.

(Id. at 1622-24 (emphasis added).) Dr. Fisher went on to explain that the soils in the eastern and far western portions of the IRW (as opposed to those in the "sweet spot" in the central portion) have high potential for runoff during rain events. (Id. at 1629.)

Dr. Fisher also summarized the results of peer-reviewed studies, conducted by the University of Arkansas, of poultry-waste runoff on test plots of land:

[Question from Plaintiff's counsel:] And can you tell the Court what was found with regard to those test plots and the runoff of poultry waste?

....

... Generally, what becomes of the poultry waste constituents after they leave the fields in this runoff?

[Fisher:] Well, as they leave the fields in the runoff and probably in some instances even if they don't leave the field as runoff, they—once it's been put on the field, it's entered the environment. Once water

has—enough water has been put on this, if a material is present in the runoff, it enters ephemeral drainageways and those drainageways lead to permanent streams. And so runoff from fields enters streams. And as you can see in this sort of terrain, some of that material will also infiltrate and enter the groundwater.

(Id. at 1634 (emphasis added).) In summary, Dr. Fisher offered his expert opinion that the IRW’s karst geology “permits more ready transport of [poultry waste] materials into the surface water” of the region, and that that karst geology “facilitates the transport of poultry waste and its constituents into groundwater.” (Id. at 1640.)

Other witnesses testifying as to poultry litter’s risk to IRW waters included Oklahoma’s Secretary of the Environment, Miles Tolbert, who quoted a Natural Resource Conservation Service report warning that “[n]utrients and bacteria from animal waste applied to fields and in inadequate domestic septic systems could potentially contaminate the Boone Aquifer,” which is the aquifer underlying the IRW (id. at 1392-93); Dr. Christopher Teaf, who testified that because of its fine, powder-like structure, and because of its application in “large quantities on focused areas over a short period of time in the year during which nearly half of the rainfall for the year occurs,” poultry litter is more likely than cow manure to leach into the water supply (id. at 1497-98, 1506-07), that the bacteria in poultry litter have “adaptive mechanisms” that permit them to survive the stresses of being applied to fields (id. at 1500-01), and that the University of Arkansas’s cooperative extension service has warned, in its Dry Poultry Manure Management

publication, that mishandled poultry waste poses a risk to surface waters and groundwater (*id.* at 1504-05); and Dr. Lowell Caneday, who testified, over stiff defense objections, about his experience watching poultry litter run off of a field during a rainstorm (Aplt. App. vol. VI at 1853-55) (“And it looked as though the field was literally moving across the road in front of me as the float materials of the litter floated on the rain.”).

Even after properly excluding the testimony of discredited experts Harwood and Olsen, the district court thus had before it significant credible evidence tending to demonstrate land-applied poultry litter’s risk to the IRW’s waters and the people who use them.

C. *The district court’s failure to consider evidence of risk*

In reaching its implicit holding (*see* Maj. op. at 23) that because “Oklahoma could not establish [poultry litter’s] causation” of actual harm to the waters of the IRW, the State “thus . . . could not establish a likelihood of success on the merits of its RCRA claim,” the district court failed to make findings of fact or come to conclusions of law “broad enough to cover all material issues” at stake in its determination of Oklahoma’s likelihood of success on the merits, OCI Wyo., 479 F.3d at 1203. For success on the merits under § 6972(a)(1)(B) requires not “proof of actual harm to health or the environment,” but rather a demonstration that “there may be a risk of harm,” Burlington Northern, 505 F.3d at 1020, and Oklahoma put on credible evidence of risk of harm to IRW waters,

and to those who use them, by putting on evidence of plausible pathways by which poultry litter constituents, including pathogenic bacteria, could reach those waters. In a motion for preliminary injunction under RCRA's citizen-suit provision, that credible evidence of risk patently constitutes a "material issue" that the district court was required to address under the correct legal standard before determining Oklahoma's likelihood of success on the merits.²

The majority opinion excuses the district court's failure to "explicitly discuss RCRA's 'may present' language" on the ground that "given the district court's view of the evidence, Oklahoma failed to link land-applied poultry litter and the bacteria in the IRW." (Maj. op. at 11-12.) Yet the district court's constricted "view of the evidence" is precisely the problem here, as the opinion and order never so much as mentions Oklahoma's credible evidence of risk, nor the § 6972(a)(1)(B) and Burlington Northern standard under which that evidence was required to be evaluated.

I therefore must conclude that the district court abused its discretion in denying the motion for preliminary injunction on the basis of an implied holding as to Oklahoma's likelihood of success on the merits, as the court's failure to

²Before this court, Oklahoma argued that the district court's actual-causation standard was legal error under RCRA not only because it required a demonstration of actual harm rather than a demonstration of risk of harm, but also because it established a "sole cause" requirement. (See Maj.op. at 14.) I agree with the majority opinion's conclusion that this straw-man argument was unfounded, and that the district court's opinion does not create a "sole cause" requirement.

apply the correct legal standard to the evidence constitutes a clear “error of law.” See RoDa Drilling Co. v. Siegal, 552 F.3d 1203, 1208 (10th Cir. 2009) (quotation omitted). As a result, I would vacate the order and remand for the district court to apply the correct legal standard under RCRA to Oklahoma’s evidence of risk, and to satisfy Rule 52(a)’s requirements for findings of fact and conclusions of law in applying that standard.

IV. The remaining factors to be satisfied for a preliminary injunction

Even with its evidence of risk evaluated under the correct legal standard, Oklahoma faces a steep uphill battle in order to succeed on its motion for preliminary injunction. In order to prevail on such a motion, a plaintiff must show “(1) a substantial likelihood of success on the merits of the case; (2) irreparable injury to the movant if the preliminary injunction is denied; (3) the threatened injury to the movant outweighs the injury to the other party under the preliminary injunction; [and] (4) the injunction is not adverse to the public interest.” O Centro, 389 F.3d at 999 (quoting Kikumura v. Hurley, 242 F.3d 950, 955 (10th Cir. 2001)). This is, on its own, a rigorous test, and one made all the more rigorous when, as in this case, the plaintiff seeks an injunction that has been “historically disfavored.” Id. at 975-77. Because Oklahoma is seeking an injunction that would alter the status quo, it must make a “heightened showing” of the four factors necessary for ordinary preliminary injunctions. Id. at 976-77. That “heightened showing” requirement means that the State’s motion “should be

even more closely scrutinized to assure that the exigencies of the case support the granting of a remedy that is certainly extraordinary.” Id. at 979.

At oral argument, the Poultry Integrators suggested that this injunction would have a substantial impact on local industry. Furthermore, trial itself is now just a few months away. Thus, I have significant doubt as to whether Oklahoma could prevail under the district court’s heightened scrutiny of the three non-merits prongs of the preliminary injunction analysis. Nonetheless, it is for the district court, not this court, to make that determination in the first instance. The district court’s opinion and order was not grounded in those non-merits factors, and neither is the majority opinion.

V. Conclusion

The district court’s ruling was in error because it failed to apply RCRA’s substantial endangerment test to Oklahoma’s credible evidence of risk, and instead required the state to offer proof of extant bacterial contamination actually caused by land application of poultry litter. And while the majority opinion articulates the proper legal standard of endangerment and risk (Maj. op. at 11-13), it errs by (1) failing to consider, under that standard, Oklahoma’s credible evidence of risk to the IRW’s waters and those who use them; and (2) failing to hold the district court to the mandate of Rule 52(a), which requires that the district court—not this court—make findings of fact and reach conclusions of law as to Oklahoma’s likelihood of success on the merits under RCRA’s citizen-suit

provision.

This court has made clear that under Rule 52(a), “[i]t is not our function to search the record and analyze the evidence in order to supply findings which the trial court failed to make.” OCI Wyo., 479 F.3d at 1205 (quotation omitted). Yet that is exactly the function the majority opinion performs (see Maj. op. at 12-14) in order to conclude that the district court held “by implication” that the State “could not establish a likelihood of success on the merits of its RCRA claim” (id. at 23). I conclude, instead, that we must hold the district court to its obligation under the Federal Rules.

Therefore, I would vacate the district court’s order and remand for the district court to satisfy its burden of evaluating Oklahoma’s likelihood of success on the merits under the correct legal standard, or of making findings of facts and reaching conclusions of law as to one or more of the remaining three prongs of the preliminary injunction standard, as heightened under O Centro. In either case, the findings of fact must be made and the conclusions of law must be reached in the first instance by the district court, not by us.