

ILLINOIS COMMERCE COMMISSION

DOCKET No. 12-0598

REBUTTAL TESTIMONY

OF

**JAMES F. DWYER
EDM INTERNATIONAL, INC.**

Submitted On Behalf

Of

AMEREN TRANSMISSION COMPANY OF ILLINOIS

APRIL 26, 2013

TABLE OF CONTENTS

	Page No.
I. INTRODUCTION AND WITNESS QUALIFICATIONS	1
II. PURPOSE AND SCOPE.....	2
III. STIPULATION BETWEEN TNC AND ATXI.....	3
IV. RESPONSE TO DR. JEFFERY WALK	5
V. RESPONSE TO DR. MICHAEL PATRICK WARD	10
VI. RESPONSE TO BOTH DRS. WARD AND WALK.....	13
VII. RESPONSE TO COLES COUNTY LANDOWNERS.....	14
VIII. CONCLUSION	15

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8 **I. INTRODUCTION AND WITNESS QUALIFICATIONS**

9 **Q. Please state your name, business address and present position.**

10 **A.** My name is James F. Dwyer. I am employed by EDM International, Inc. (“EDM”),
11 4001 Automation Way, Fort Collins, CO 80525.

12 **Q. Please summarize your educational background and professional experience.**

13 **A.** I earned a B.S. in Biology from the University of Montana, an M.S in Wildlife and
14 Fisheries Science from the University of Arizona, and a Ph.D. in Fisheries and Wildlife Sciences
15 from Virginia Tech. I am a Certified Wildlife Biologist who works with electric utilities to
16 develop and implement solutions to problems arising when birds interact with overhead electric
17 systems. I work to minimize risks of avian electrocution and collision with overhead power
18 structures and lines, and publish in peer-reviewed scientific journals. For more detail, please see
19 my Resume, attached as an Appendix to this testimony.

20 **Q. What are your duties and responsibilities in your present position?**

21 **A.** My primary duties and responsibilities include assisting in the development of Avian
22 Protection Plans (APPs [described in more detail below]) for electric utilities to minimize

23 negative interactions between birds and power lines, and educating clients so their APPs can be
24 implemented to greatest effect. I also conduct original research to understand and develop
25 environmentally and fiscally responsible solutions to problems involving avian interactions with
26 power lines. Recent projects include 1) a study investigating whether birds nesting in high risk
27 areas on distribution structures can be shifted to nest on low risk areas of the same structure, 2) a
28 study investigating whether commercially marketed perch deterrents are likely to be effective in
29 areas where raptors are suspected of preying on grouse, 3) two separate studies designed to use
30 multivariate models to predict electrocution risk on power structures, so at-risk structures can be
31 targeted for retrofitting before a problem occurs, and 4) two separate studies investigating the
32 effectiveness of marking power lines to reduce collision. Each of these studies has either been
33 published in a peer-reviewed scientific journal, is accepted for publication, is under review for
34 publication, or is ongoing.

35 **II. PURPOSE AND SCOPE**

36 **Q. What is the purpose of your rebuttal testimony?**

37 **A.** The purpose of my rebuttal testimony is to respond to the direct testimonies of Dr. Jeff
38 Walk (TNC Exhibit 2.0), Dr. Michael Patrick Ward (TNC Exhibit 3.0), Mr. Mike Popham (Coles
39 County Landowners Exhibit 1.0) and Mr. Scott R. Weber (Coles County Landowners Exhibit
40 3.0) addressing their concerns regarding avian impacts of ATXI's Primary and Alternate Route. I
41 limit my testimony to avian-power line interactions. My failure to address any witnesses'
42 testimony or position on other topics should not be construed as an endorsement of same.

43 **Q. Are you sponsoring any exhibits in support of your testimony?**

44 **A.** Attached as Appendix B is a list of publications I have authored or co-authored. These
45 publications include some of the peer-reviewed articles on avian interactions with overhead
46 electric power systems that I cite in my testimony here, as well as studies of avian ecology in
47 general.

48 **III. STIPULATION BETWEEN TNC AND ATXI**

49 **Q. What is your understanding of the Stipulation entered into by ATXI and TNC**
50 **regarding each parties preferred route for the portion of the route from Meredosia to**
51 **Ipava?**

52 **A.** I understand that the Stipulated Route is ATXI's Alternate Route modified slightly to
53 avoid the Spunky Bottoms Preserve and the Illinois Department of Transportation ("IDOT")
54 Wetland Mitigation Bank.

55 **Q. Because Dr. Ward and Dr. Walk are primarily concerned about negative avian**
56 **impacts in the Spunky Bottoms Preserve and the IDOT Wetland Mitigation Bank, how**
57 **does the fact that the Stipulated route avoids these areas affect Dr. Walk and Dr. Ward's**
58 **Direct Testimony filed in this proceeding?**

59 **A.** The concerns raised in the testimonies of Drs. Walk and Ward are primarily related to
60 their assertions of avian impacts in the Spunky Bottoms Preserve and the IDOT Wetland
61 Mitigation Bank. The Stipulated Route, which ATXI and TNC have now adopted as the route
62 the parties will request that the Illinois Commerce Commission approve (Stipulation Ex. 3),
63 avoids the Spunky Bottoms Preserve and the IDOT Wetland Mitigation Bank, thus avoiding the
64 concerns raised by Drs. Walk and Ward.

65 **Q. How does this Stipulation affect your testimony?**

66 **A.** As discussed in Ms. Donell Murphy's testimony, the Stipulated Route between ATXI
67 and The Nature Conservancy is the preferred route for the portion of the transmission line from
68 Meredosia to Ipava, IL. My testimony rebutting the claims of Dr. Ward and Dr. Walk is
69 submitted to support ATXI's Primary and Alternate route as a contingency to preserve argument
70 in the event that the Commission does not adopt the Stipulated Route entered into between ATXI
71 and TNC.

72 **Q. Generally speaking, do you agree with Drs. Walk and Ward regarding their**
73 **assessment of avian impacts that will result from ATXI's Primary and Alternate Route for**
74 **that portion of the route from Meredosia to Ipava?**

75 **A.** I do not agree because Drs. Walk and Ward provide unsupported assertions that
76 ATXI's proposed Primary and Alternate Routes will result in negative avian impacts. They
77 provide only a single peer-reviewed scientific article to support their assertions despite that fact
78 numerous peer-reviewed scientific articles describing interactions between birds and electric
79 utility structures are available. Careful evaluation of the best available science describing avian
80 responses to power line corridors are necessary to objectively evaluate the assertions made by
81 Drs. Walk and Ward. Their testimony fails to provide the best available science relevant to and
82 needed to evaluate their concerns with regard to either ATXI's Primary or Alternate Routes, and
83 fails to compare the risks they assert on these routes to risks associated with the Alternate Routes
84 proposed by TNC. Because they failed to use peer-reviewed scientific literature in developing
85 their direct testimony, the merits of their arguments cannot be objectively evaluated. Specific
86 concerns regarding their testimony are described below.

87 **IV. RESPONSE TO DR. JEFFERY WALK**

88 **Q. Throughout Dr. Walk's direct testimony he cites electrocution and nesting concerns**
89 **(line 147, 160-164, 275, 321) resulting from transmission lines. What is your experience**
90 **regarding avian electrocution and nesting concerns along transmission lines?**

91 **A.** I conduct original research studying avian electrocution and nesting along power lines,
92 as evidenced by the following articles that I have authored or co-authored regarding
93 electrocution (Dwyer 2004, Dwyer 2006, Dwyer and Mannan 2007, Dwyer and Mannan 2009,
94 Harness and Dwyer 2011, Dwyer and Harness 2012), nesting (Dwyer and Leiker 2012), collision
95 (Sporer et al. 2013) and perching on power structures (Dwyer and Doloughan 2013). I also work
96 regularly with electric utilities to understand and mitigate specific structures and spans where
97 negative interactions have occurred or might be expected.

98 **Q. Given that experience, can you explain whether you agree with Dr. Walk's**
99 **assertions regarding electrocution and nesting concerns?**

100 **A.** My research and experience strongly suggest that neither electrocution nor nesting are
101 likely to be of concern given the monopole davit-arm towers described in the document "ATXI
102 7.1-7.3 FINAL". Specifically, avian electrocution is primarily associated with distribution
103 rather than transmission structures, and where electrocution has been of concern on transmission
104 structures, those structures have typically been specific individual lattice structures where phase-
105 to-ground clearances did not meet Avian Power Line Interaction Committee (APLIC 2006)
106 recommendations. APLIC (2006) recommends 60 inches of horizontal separation and 40 inches
107 of vertical separation for all lines up to 60 kV. Above 60 kV, APLIC (2006) recommends an
108 additional 0.2 inches of separation for each additional kV. For the 345 kV line ATXI has

109 proposed, these critical dimensions are $(60'' + (0.2'' * 285 \text{ kV})) = 117''$ horizontal separation
110 (9.75 ft) , and $(60'' + (0.2'' * 285 \text{ kV})) = 97''$ vertical (8.08 ft) . The horizontal separation
111 provided by the structures described in ATXI Ex. 7.1-7.3 include a minimum of $174''$ horizontal
112 separation, and $126''$ vertical separation from an energized phase to the davit arm below where a
113 bird might perch. Thus, based on the APLIC (2006) industry standard, avian electrocution is
114 unlikely on these structures. Conductor-to-conductor and conductor to ground separation would
115 be similar if lattice structures were used, so electrocution risks would remain minimal, but could
116 be mitigated against if needed. Similarly, nesting concerns are not an issue because nesting
117 typically occurs on distribution structures and H-frame transmission structures (APLIC 2006 and
118 citations therein), but nesting related issues are notably rare on monopole davit-arm structures.
119 This is true because monopole davit-arm structures such as those described in ATXI Ex. 7.1-7.3
120 typically do not provide sufficient horizontal surfaces to support nesting. Nesting does
121 occasionally occur on lattice structures. Osprey, Bald Eagle, and Peregrine Falcon all have been
122 documented nesting on lattice structures. Dr. Walk includes these species in the list of
123 threatened and endangered species he speculates would be negatively impacted by the line.
124 However, Dr. Walk fails to explain how providing a threatened or endangered species with a
125 potential nest substrate would harm the species because the risks of electrocution can be
126 mitigated, if necessary, by employing the practices similar to those described in APLIC and
127 USFWS (2005)), APLIC (2006), Dwyer and Leiker (2012), Dwyer and Doloughan (2013), and
128 Sporer et al. (2013).

129 **Q. Are avian risks of electrocution and nesting issues, legitimate concerns for the**
130 **selection of an appropriate route in this proceeding?**

131 **A.** No. The inclusion of electrocution and nesting concerns are distracting irrelevancies
132 when discussing the Primary Route, Alternate Route, or any other route as long as the structures
133 described in ATXI Exhibits 7.1 - 7.3 are used. If lattice structures are used, electrocution risk
134 remains minimal and nesting may actually be beneficial, but either way mitigation measures to
135 minimize the likelihood of either electrocution or nesting can be developed based on APLIC and
136 USFWS (2005), APLIC (2006), Dwyer and Leiker (2012), Dwyer and Doloughan (2013), and
137 Sporer et al. (2013).

138 **Q. Do you agree with Dr. Walk's statement, "Most threatened and endangered species**
139 **occurring on the Spunky Bottoms Preserve and surrounding lands would be adversely**
140 **affected by construction and maintenance of the proposed transmission line (lines 128-**
141 **130)?**

142 **A.** No, I do not because Dr. Walk fails to provide peer-reviewed scientific literature to
143 support this statement for any species listed in lines 97-123. Simply asserting that a concern
144 exists without supporting it in detail does not meet due diligence criteria. While Dr. Walk
145 explicitly states "most" of the species on his list would be adversely affected, he fails to
146 substantiate those claims by providing information on which species might not be affected, or
147 might benefit, so the total costs and benefits to species of concern may be evaluated. Dr. Walk
148 also fails to distinguish between hypothesized impacts associated with construction and
149 hypothesized impacts associated with maintenance.

150 **Q. Does Dr. Walk substantiate his statement that, “studies have shown that the rail**
151 **family (represented by the king rail and black rail at the Spunky Bottoms Preserve) are**
152 **particularly vulnerable to collisions with utility lines (See TNC Exhibit 2.2).”?**

153 **A.** Given the study cited by Dr. Walk, it is not possible to substantiate his claims. The
154 TNC Exhibit 2.2 is a single 15-year old summary paper on avian collision and electrocution
155 concerns that a) does not mention king rails or black rails specifically, and b) has been followed
156 by numerous peer-reviewed scientific articles on collision (See Literature Cited). TNC Exhibit
157 2.2 fails to mention that collision mitigation strategies, including papers published prior to Dr.
158 Walk’s citation, have been largely successful (Morkill and Anderson 1991, Brown and Drewein
159 1995, Severno et al. 1996, Janss and Ferrer 1998, Yee 2008, Murphy et al. 2009, Ventana
160 Wildlife Society 2009, Jenkins et al. 2010, Barrientos et al. 2011, Barrientos et al. 2012, Sporer
161 et al. 2013). Because citing decisions such as that addressed here are to be based on the best
162 available science, and TNC Exhibit 2.2 fails to provide current science, Dr. Walk has failed to
163 provide current literature supporting his concerns relating to rails in particular, and for each
164 species in lines 97-123 in general. In the absence of supporting documentation, Dr. Walk’s
165 claims are unsubstantiated and consequently, unconvincing.

166 **Q. Do you agree with Dr. Walk’s statement, “The construction and maintenance of the**
167 **proposed transmission line would greatly diminish the ecological values and public**
168 **enjoyment of the Spunky Bottoms Preserve and surrounding lands (lines 259-261).”?**

169 **A.** Again Dr. Walk has failed to provide evidence substantiating his claim. Dr. Walk
170 provides a single, relatively old, peer reviewed scientific paper to support his concerns (TNC Ex.
171 2.2). The paper does not define or explicitly address “ecological values” nor does it provide any

172 evidence with regard to “public enjoyment.” My personal experience as a hiker and mountain
173 biker is that transmission line rights of way often provide access to trails, thus increasing rather
174 than decreasing “public enjoyment” of natural areas, at least for some users. Dr. Walk has failed
175 to provide detailed scientific papers that a) define “ecological values” and “public enjoyment”
176 and b) explicitly consider ecological values and public enjoyment with respect to transmission
177 lines. Due to the omission of supporting documentation, his claims regarding ecological values
178 and public enjoyment are unsubstantiated.

179 **Q. In response to the question “The Illinois River is part of the Mississippi flyway**
180 **where many birds migrate. Will the transmission line affect migrating birds also? “Dr.**
181 **Walk asserts (lines 319-320) that “the collision and electrocution hazard for migrating**
182 **birds would be substantially increased by construction of the proposed Primary Route.”**
183 **Do you agree that ATXI’s Primary Route poses a greater risk to migrating birds than**
184 **TNC’s alternative routes?**

185 **A.** I do not agree because any transmission line between Meredosia, IL and Ipava, IL, will
186 necessarily be constructed in the Mississippi flyway. The U.S. Fish and Wildlife Service and its
187 partner agencies manage for migratory birds based on specific migratory route paths within
188 North America (Atlantic, Mississippi, Central, and Pacific). Based on those route paths, state
189 and federal agencies developed the four administrative Flyways that administer migratory bird
190 resources. (USFWS 2013a). The entire state of Illinois is included in the USFWS definition of
191 the Mississippi flyway (USFWS 2013b). Thus, any power line between Meredosia, IL and
192 Ipava, IL, including the two Alternate Routes proposed by TNC (which I understand to have
193 been withdrawn in any event), will occur within the Mississippi Flyway. Dr. Walk does not

194 provide any scientific support for his assertion that the routes proposed by ATXI would a) lead to
195 avian collision risk within the Mississippi flyway in general, or b) lead to greater avian collision
196 risk than the Alternate Routes proposed by TNC in particular. Dr. Walk also fails to provide
197 specific peer-reviewed scientific articles indicating the specific landscape and habitat features
198 associated with avian collision risk during migration, and explicitly explain how the routes
199 proposed by ATXI are likely to be involved in more avian collisions than would occur in the
200 alternate routes proposed by TNC. Although avian collision is sometimes associated with birds
201 moving through agricultural areas (Morkill and Anderson 1991, Brown and Drewien 1995, Janss
202 and Ferrer 1998, APLIC 2006, Murphy et al. 2009, Rollan et al. 2010, Shaw et al. 2010,
203 Barrientos et al. 2012,), and because the TNC routes appear to pass through agricultural areas,
204 Dr. Walk has not provided an explanation of why the agricultural areas included in TNC's
205 proposed route do not pose substantial avian collision risk. Dr. Walk's distracting reference to
206 electrocution risk is addressed in my testimony above.

207 **V. RESPONSE TO DR. MICHAEL PATRICK WARD**

208 **Q. What additional information would be helpful in assessing Dr. Ward's opinion with**
209 **regard to avian impacts due to transmission lines?**

210 **A.** While Dr. Ward states, "I compare survival or reproductive success of individuals in
211 different landscapes or within agricultural fields under different land-use practices (lines 29-31)."
212 Dr. Ward fails to explicitly reference which of his publications in TNC Exhibit 3.1 address
213 nesting with respect to forest fragmentation in general and fragmentation by transmission power
214 lines specifically. Dr. Ward should use his research to provide explicit detail from his peer-
215 reviewed work on the effects he postulates but fails to support with scientific literature

216 **Q. Dr. Ward contends there is data that supports the conclusion that the Spunky**
217 **Bottoms Preserve has great ecological value, specifically citing the Critical Trends**
218 **Assessment Program which compiles data that provides a baseline from which it is possible**
219 **to compare regional and site-specific patterns and assess changes in ecological conditions.**
220 **(lines 130-134). Do you agree with his analysis of this data?**

221 **A.** No, because neither the data nor his analyses have been provided. The Critical Trends
222 Assessment Program (“CTAP”) website provides a “- Publications” link, but that link leads to an
223 empty page, a copy of which appears as ATXI Exhibit 20.1, which I visited on 19 April 2013, as
224 does the “- Data” link. Peer-reviewed analyses (publications) of CTAP data are not provided.
225 Failure to provide data and analyses vetted by the scientific community precludes objective
226 assessment and substantiation of Dr. Ward’s claims.

227 **Q. Has Dr. Ward substantiated his claim that “Both the Spunky Bottoms Preserve and**
228 **the surrounding land have great ecological value that would be impaired by siting**
229 **Ameren’s transmission line on the Primary Route (lines 65-66).”?**

230 **A.** No. Dr. Ward failed to provide citations to peer-reviewed publications describing this
231 ecological value, i.e., avian point count data. Specifically, to evaluate the potential effects of
232 ATXI’s Routes vs. TNC’s Alternate Routes, data comparing avian density and abundance along
233 Ameren’s Primary and Alternate Routes to the two Alternate Routes proposed by TNC would be
234 useful. In the absence of such data, Dr. Ward’s assertions do not facilitate objective assessment
235 of the relative impacts to birds along the various routes. Thus, the assertion that TNC’s proposed
236 alternate routes pose reduced avian collision risks relative to ATXI’s proposed routes cannot be
237 substantiated.

238 **Q. In referring to wetlands in Illinois, Dr. Ward states, “These wetlands are the most**
239 **important habitats in Illinois in terms of global conservation (lines 87-88).” Do you agree**
240 **with this statement?**

241 **A.** No, because categorical statements such as “...the most important...” must be
242 accompanied with directly relevant citations. Dr. Ward has failed to provide substantiating
243 materials, so again, his claim cannot be objectively substantiated.

244 **Q. Do you agree with Dr. Ward’s statement, “Second, while species can become**
245 **accustomed to transmission lines, certain migratory species that breed in the Arctic and**
246 **winter in South America may be wary of transmission lines (lines 224-225).”**

247 **A.** No, because this assertion poses two problems. First, Drs. Ward and Walk repeatedly
248 assert that avian collision risk is a primary concern. But Dr. Walk fails to explain how birds can
249 simultaneously collide with lines while being negatively impacted by avoiding lines. If birds
250 avoid the line, then by definition, that should prevent collision. Second, the statement
251 specifically focuses on avoidance of lines by long-distance migrants. Dr. Ward fails to provide
252 specific documentation in support of his claim “species that breed in the Arctic and winter in
253 South America” in particular are likely to avoid transmission lines. In the absence of supporting
254 material, the apparent paradox that birds will simultaneously avoid lines and collide with lines is
255 unsubstantiated.

256 **VI. RESPONSE TO BOTH DRS. WARD AND WALK**

257 **Q. Have Dr. Walk and Dr. Ward substantiated the threat of ATXI's Primary or**
258 **Alternate Routes to breeding at Spunky Bottoms by king rails, a state endangered species?**

259 **A.** No, they have not. Species are sometimes listed as endangered in areas at or slightly
260 beyond the extent of their typical range. Individuals are rare, but not unheard of at natural range
261 edges even when populations are healthy overall. The Birds of North America species account
262 for King Rail (Poole et al. 2005) indicates regular breeding by King Rails extending from the
263 gulf coast from Texas to Florida, up the Mississippi River to the southern-most tip of Illinois,
264 and scattered breeding North of that point. The Sibley Guide to Birds (Sibley 2000) also
265 indicates regular breeding season occurrence from the Gulf Coast north along the Mississippi to
266 the southern terminus of Illinois. Spunky Bottoms is approximately 100 miles north of the extent
267 of the normal breeding range indicated by these authors. Breeding by King Rails at Spunky
268 Bottoms occurs well beyond the species' regular breeding range, and appears unlikely to
269 contribute substantially to the population overall, which is not listed as Federally threatened or
270 endangered. Drs. Walk and Ward have failed to provide information on the productivity of King
271 Rails at Spunky Bottoms. In the absence of supporting materials, their claims are
272 unsubstantiated.

273 **Q. Both Dr. Walk (lines 661-664) and Dr. Ward (lines 236-238) urge the Commission to**
274 **select one of TNC's alternate routes for the Meredosia to Ipava segment; have they**
275 **provided any evidence that TNC's routes would have less of an environmental impact?**

276 **A.** No, they have not. Though TNC witnesses provide argument describing possible
277 negative effects of ATXI's Primary Route and Alternate Route, they do not explain how the

278 same effects would be reduced in the two Alternate Routes TNC proposes. In the absence of
279 comparative data, the assertion that TNC's proposed alternate routes pose less risk cannot be
280 objectively evaluated and substantiated.

281 **Q. Can you properly evaluate the claims of Drs. Walk and Ward with respect to**
282 **negative avian impacts of ATXI's Primary or Alternate Route?**

283 **A.** No. Due to the lack of peer-reviewed scientific literature referenced in the direct
284 testimony of Drs. Walk and Ward, I find the testimony describing their concerns with both the
285 Primary and Alternate Routes unsupported, and therefore unconvincing.

286 **VII. RESPONSE TO COLES COUNTY LANDOWNERS**

287 **Q. What is your response to the testimony of Messrs. Ron Popham and Scott Weber**
288 **that the ATXI Primary Route would negatively impact bald eagles nests, which they claim**
289 **to have observed?**

290 **A.** It is unclear where exactly the alleged nests are located. However, if there are eagle
291 nests in the area, they can be addressed by mitigation measures under ATXI's Avian Protection
292 Plan.

293 **Q. What is the Avian Protection Plan ?**

294 **A.** EDM developed an Avian Protection Plan ("APP") for Ameren Illinois in 2012. The
295 APP follows guidelines developed by the Edison Electric Institute ("EEI"), the Avian Power
296 Line Interaction Committee ("APLIC", of which Ameren is a member) and the U.S. Fish and
297 Wildlife Service ("USFWS"). These guidelines are designed to assist electric utilities in creating

298 an APP that works with an individual utility's existing infrastructure and new construction
299 practices to minimize impacts to avian species (APLIC and USFWS 2005).

300 **Q. Does the APP have data on the location of eagle nests near the Primary Route?**

301 **A.** Yes. To develop Ameren's APP, EDM used 2009 data on the locations of bald eagle
302 use areas provided by the Illinois Natural Heritage Program. These were the most complete data
303 available to EDM at the time (EDM 2012). These data support the assertion that bald eagle
304 foraging may occur near the Primary Route, but do not indicate the location of a bald eagle nest
305 adjacent to ATXI's Primary Route. If bald eagle nests are located near the Primary Route,
306 however, mitigation measures to minimize the likelihood of a negative interaction can be
307 developed based on Ameren's APP (EDM 2012), APLIC and USFWS guidelines (APLIC and
308 USFWS 2005), and APLIC guidelines (APLIC 2006). Typical mitigation measures include
309 limiting construction and maintenance activities during breeding seasons, and marking lines to
310 minimize collision risks. Such mitigation measures would require precise coordinates for the
311 nest or nests Mr. Popham and Mr. Weber describe (which has not at this point been provided).

312 **VIII. CONCLUSION**

313 **Q. Does this conclude your rebuttal testimony?**

314 **A.** Yes, it does.

James F. Dwyer
Research Scientist

Education

- Ph.D. in Fisheries and Wildlife Sciences, Virginia Tech State University, May 2010. Dissertation: Ecology of Non-breeding and Breeding Crested Caracaras (*Caracara cheriway*) in Florida.
- M.S. in Wildlife and Fisheries Science, University of Arizona, May 2005. Thesis: Investigating and Mitigating Raptor Electrocutation in an Urban Environment.
- B.A. in Biology, Emphasis in Ecology, University of Montana, May 2000.

Grants, Awards, and Contracts

- **Dwyer, J.F.** 2013. Contract. \$20,000. Secured for EDM from San Diego Gas & Electric Company, Sempra Energy. Engineering services modeling the effects of Swan Flight Diverters.
- **Dwyer, J.F.** 2012. The Wildlife Society, Certified Wildlife Biologist. <http://wildlife.org/certification/directory>.
- **Dwyer, J.F.** 2012. Contract. \$5,000. Secured for EDM from Western Area Power Administration (WAPA) to conduct and publish statistical analyses of avian collision and line marking data collected by WAPA from 2006 – 2008.
- **Dwyer, J.F.** 2012. Contract. \$23,330. Secured for EDM from Tri-State Generation and Transmission Association, Inc. to publish 2011 results and expand testing of a device to prevent nesting by Chihuahuan Ravens (*Corvus cryptoleucus*) on H-frame transmission structures.
- **Dwyer, J.F.** and A. H. Stewart. 2012. Contract. \$2,634,120. Secured for EDM from San Diego Gas & Electric Company, Sempra Energy. Avian-power line collision investigation and mitigation study: Sunrise avian monitoring and mitigation plan revision and implementation. Agreement #: 5660024498.
- **Dwyer, J.F.** 2011. Contract. \$20,000. Secured for EDM from Bureau of Land Management Oregon-Spokane District (ORW00). Perch deterrent study. Order No. L11PX01692.
- **Dwyer, J.F.** 2011. Contract. \$26,000. Secured for EDM from Southern California Edison (SCE) to sample SCE distribution poles throughout their service area, and to provide reports and photographic documentation of avian nesting and mortality on SCE distribution structures.
- **Dwyer, J.F.** 2011. Contract. \$16,053. Secured for EDM from Tri-State Generation and Transmission Association, Inc. to develop and test a device to prevent nesting by Chihuahuan Ravens (*Corvus cryptoleucus*) on H-frame transmission structures.
- Dockrill, C., S.G. Cockwell, and **J.F. Dwyer**. 2010. Grant. \$7,200. National Birds of Prey Trust (UK) grant secured for Falklands Conservation to study movement, survival, and social ecology of Striated Caracaras on Saunders Island.
- Morrison, J.L., J.D. Fraser, and **J.F. Dwyer**. 2010. Grant. \$140,000. United States Fish and Wildlife Service grant secured for Virginia Tech to investigate the effects of land conversion projects on Crested Caracaras in Florida.
- **Dwyer, J.F.** 2010. Contract. \$9,550. U.S. Dept. of Justice. Litigative consultant for avian-power line interactions.
- **Dwyer, J.F.** 2009. \$350. Award. Virginia Tech Graduate Student Association. Presented research at the Raptor Research Foundation Annual Conference. Pitlochry, Scotland.
- Morrison, J.L. and **J.F. Dwyer**. 2009. Contract. \$38,245. Secured for Eagle Environmental to study the response of breeding Crested Caracaras to loss of nesting habitat.
- **Dwyer, J.F.** 2009. Award. Virginia Council of Graduate Schools Certificate of Achievement. In recognition of contribution to the Fourth Annual Graduate Research Forum.

Grants Awards, and Contracts (cont.)

- **Dwyer, J.F.** 2009. Grant. \$400. Tucson Electric Power Company Publication Grant.
- **Dwyer, J.F.** 2008. Award. \$100. 1st Place. William C. Andersen Student Presentation Award for “Inter- and Intra- Specific Aggression of Crested Caracaras in South Florida.” Raptor Research Foundation Annual Meeting. Missoula, MT.
- **Dwyer, J.F.** and J. L. Morrison. 2008. Contract. \$12,600. Secured for Eagle Environmental to study the response of breeding Crested Caracaras to loss of nesting habitat.
- **Dwyer, J.F.** 2007. Award. \$150. 2nd Place. Student Award in the Natural Environment category of the Dean’s Forum on the Environment, for “Conservation of Non-Breeding Crested Caracaras in Florida.” College of Architecture and Urban Studies, College of Natural Resources, Virginia Tech.
- **Dwyer, J.F.** 2006. Award. \$79,392. Cunningham Doctoral Scholar Fellowship. Graduate College, Virginia Tech.
- **Dwyer, J.F.** 2006. Grant. \$800. Tucson Electric Power Company Publication Grant.
- **Dwyer, J.F.** 2004. Award. Public Service Award. University of Arizona, School of Natural Resources. Awarded to a student for the first time in the history of the award.
- **Dwyer, J.F.** 2003. Award. \$400. James R. Silliman Memorial Research Award. University of Arizona, Department of Ecology and Evolutionary Biology.

Publications

- **Dwyer, J.F.**, and K. Doloughan. *In press*. Testing systems of avian perch deterrents on electric power distribution poles. *Human-Wildlife Interactions*.
- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. *In press*. Ranges and habitat use of non-breeding Crested Caracaras in Florida. *Journal of Field Ornithology*.
- Sporer, M.K., **J.F. Dwyer**, B.D. Gerber, R.E. Harness, and A.K. Pandey. *In press*. Marking power lines to reduce avian collisions near the Audubon National Wildlife Refuge, North Dakota. *Wildlife Society Bulletin*.
- **Dwyer, J.F.** J.C. Bednarz, and R.J. Raitt. 2013. Chihuahuan Raven (*Corvus cryptoleucus*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology.
- Morrison, J.L. and **J.F. Dwyer**. 2012. Crested Caracara (*Caracara cheriway*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the *Birds of North America Online*: <http://bna.birds.cornell.edu/bna/species/249>.
- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. 2012. Within-year survival of non-breeding Crested Caracaras. *Condor* 114: 295-301.
- **Dwyer, J.F.**, J.L. Morrison, and J.D. Fraser. 2012. Evaluating survey methods for nesting Northern Crested Caracaras. *Journal of Wildlife Management* 76:857-862.
- **Dwyer, J.F.** and D.L. Leiker. 2012. Managing nesting by Chihuahuan Ravens on H-frame electric transmission structures. *Wildlife Society Bulletin*. 129. Available online at: <http://onlinelibrary.wiley.com/doi/10.1002/wsb.129/abstract>
- **Dwyer, J.F.** and R. E. Harness. 2012. Evaluating the Effectiveness of Avian Interaction Mitigating Measures and Processes. California Energy Commission. Publication number: CEC-PIR-08-026.
- Harness, R.E. and **J.F. Dwyer**. 2011. Field guide: Visual inspection of avian issues on transmission and distribution structures. Electric Power Research Institute product ID number *pending*. Palo Alto, CA.
- **Dwyer, J.F.** and J.C. Bednarz. 2011. Harris's Hawk (*Parabuteo unicinctus*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the *Birds of North America Online*: <http://bna.birds.cornell.edu/bna/species/146>

Publications (cont.)

- **Dwyer, J.F.** and S.G. Cockwell. 2011. Social hierarchy of scavenging raptors on the Falkland Islands (Malvinas). *Journal of Raptor Research* 45:229-235.
- **Dwyer, J.F.** 2010. Ecology of non-breeding and breeding Crested Caracaras (*Caracara cheriway*) in Florida. Ph.D. dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA, U.S.A. <http://scholar.lib.vt.edu/theses/available/etd-05092010-132909/> (last accessed 22 September 2011).
- Nemeth, N., **J.F. Dwyer**, J.L. Morrison, J.D. Fraser. 2009. Seroprevalence of West Nile virus and other arboviruses among Crested Caracaras (*Caracara cheriway*) in Florida. *Journal of Wildlife Diseases* 45:817-822.
- **Dwyer, J.F.** and R.W. Mannan. 2009. Return rates of aluminum versus plastic leg bands from electrocuted Harris's Hawks (*Parabuteo unicinctus*). *Journal of Raptor Research* 43:152-154.
- **Dwyer, J.F.** 2009. Raptor electrocution: A case study on ecological traps, sinks, and additive mortality. *Journal of Natural Resources and Life Science Education*. 38:93-98.
- L. Flannery and **J.F. Dwyer**. 2008. Investigating the Crested Caracara. *Ridge Rangers Volunteer News*, Spring:1-3.
- J. Rogers, and **J.F. Dwyer**. 2007. The Crested Caracara – Florida's unique falcon. *Florida Wildlife Magazine*, September/October:9-11.
- **Dwyer, J.F.**, and R.W. Mannan. 2007. Preventing electrocution of raptors in an urban environment. *Journal of Raptor Research* 41:259-267.
- **Dwyer, J.F.** 2006. Electric shock injuries in a Harris's Hawk population. *Journal of Raptor Research* 40:193-199.
- **Dwyer, J.F.** 2004. Investigating and mitigating raptor electrocution in an urban environment. M.S. Thesis, University of Arizona, Tucson, AZ.
- **Dwyer, J.F.** 2004. Raptor electrocution in Tucson. *Vermillion Flycatcher* 49:1, 4.

Presentations

- **Dwyer, J.F.** 2013. Perching mitigation for birds on utility structures. Avian Protection and Overhead Line Management Workshop. Fort Collins, CO.
- **Dwyer, J.F.** 2013. Nesting mitigation for birds on utility structures. Avian Protection and Overhead Line Management Workshop. Fort Collins, CO.
- **Dwyer, J.F.**, and R.H. Harness. 2012. A logistic regression model to predict avian electrocution risk. 5th North American Ornithological Conference. 14-18 August. Vancouver, BC, Canada.
- **Dwyer, J.F.** and K. Doloughan. 2012. Testing devices to minimize perching by raptors and corvids in grouse habitat. Western Agencies 28th Sage and Columbian Sharp-tailed Grouse workshop. 18-22 June. Steamboat Springs, CO.
- **Dwyer, J.F.**, and D. L. Leiker. 2012. Managing nesting by Chihuahuan Ravens on H-frame transmission structures. International Conference on Overhead Lines. 26-29 March. Fort Collins, CO.
- **Dwyer, J.F.** *Invited speaker*. 2012. Avian interactions with overhead power: Reliability, the law and mitigation. TE Connectivity Regular Training. 23 February. Dundee, MI.
- **Dwyer, J.F.** *Invited speaker*. 2011. Wildlife training: The Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Endangered Species Act. City of Loveland Annual Training Day. 13 December. Loveland, CO.

Presentations (cont.)

- S.J. Chiavacci, K. E. Pias, and **J.F. Dwyer**. 2011. From Duluth to Duluth: How has the focus of raptor research changed since 1995? Raptor Research Foundation Annual Conference. 5-9 October. Duluth, MN.
- **Dwyer, J.F.** and D. Leiker. *Invited speaker*. 2011. Deployment and testing of a new product to prevent nesting on H-frame transmission structures. Avian Power Line Interaction Committee (APLIC) Workshop. 10-12 August, Banff, Alberta, Canada.
- **Dwyer, J.F.** 2011. Effectiveness of mitigation measures and processes for avian interactions with overhead electric systems. California Energy Commission Staff Workshop on Reducing the Impacts of Energy Infrastructure on Wildlife, 20 July, Sacramento, CA.
- **Dwyer, J.F.** and J. Goodrich-Mahoney. 2011. Bat detection and turbine curtailment system for utility scale wind resource areas. Electric Power Research Institute meeting with We Energy, 15 June, Madison, Wisconsin.
- **Dwyer, J.F.**, and R.H. Harness. 2011. Nest management practices for overhead power structures. 76th Annual North American Wildlife and Natural Resources Conference; National Military Fish and Wildlife Association Training Workshop, 14-19 March, Kansas City, MO.
- **Dwyer, J.F.**, and R.H. Harness. 2011. Bird collisions—Mitigating measures. 76th Annual North American Wildlife and Natural Resources Conference; National Military Fish and Wildlife Association Training Workshop, 14-19 March, Kansas City, MO.
- **Dwyer, J.F.**, and R.H. Harness. 2011. Raptor electrocutions—Mitigating measures. 76th Annual North American Wildlife and Natural Resources Conference; National Military Fish and Wildlife Association Training Workshop, 14-19 March, Kansas City, MO.
- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. 2010. Testing survey methods for nesting Crested Caracaras in Florida. Raptor Research Foundation Annual Conference. 22-26 September, Fort Collins, CO.
- **Dwyer, J.F.** *Invited speaker*. 2010. Social ecology of Striated Caracaras and non-breeding Northern Caracaras. Falklands Conservation. 10 August. Stanley, Falkland Islands.
- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. 2010. Caracara gathering areas in Florida. Final report to the United States Fish and Wildlife Service. 12 January. Vero Beach, FL.
- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. 2009. Why do Crested Caracaras form groups? Raptor Research Foundation Annual Conference. 27-30 September. Pitlochry, Scotland.
- **Dwyer, J.F.** *Invited speaker*. 2009. Dominance hierarchies in Crested Caracaras: Fisheries and Wildlife Sciences Research at Virginia Tech. Graduate Student Assembly; Graduate student recruiting program. 20 February. Blacksburg, VA.
- Mannan, R.W. and **J.F. Dwyer**. 2008. Preventing raptor electrocutions in an urban environment. Contribution to symposium: Avian collisions with anthropogenic vertical features. Wildlife Society Annual Conference. 8-12 November. Miami, FL.
- **Dwyer, J.F.**, J.L. Morrison, and J.D. Fraser. 2008. Inter- and intra- specific aggressions of Crested Caracaras in Florida. Raptor Research Foundation Annual Meeting. 25-27 September. Missoula, MT.
- **Dwyer, J.F.**, J.L. Morrison, and J.D. Fraser. 2008. Inter- and intra- specific aggressions of Crested Caracaras in Florida. Raptor Research Foundation Annual Meeting. 25-27 September. Missoula, MT.
- **Dwyer, J.F.**, J.L. Morrison, and J.D. Fraser. 2007. Habitat, movement, and communal roosting of non-breeding Crested Caracaras (*Caracara cheriway*) in Florida. Raptor Research Foundation and Hawk Migration Association of North America joint Conference. 12-16 September. Fogelsville, PA.

Presentations (cont.)

- **Dwyer, J.F.** *Invited speaker.* 2006. Preventing and responding to raptor electrocution in Florida, and investigating the habitat use of Florida's Crested Caracaras. Florida Wildlife Rehabilitators Association Annual Meeting. 29 September. Brooksville, FL.
- **Dwyer, J.F.** *Invited speaker.* 2005. Audubon Greenwich Quaker Ridge raptor migration count annual report. 5 November. Greenwich, CT.
- **Dwyer, J.F.** and R.W. Mannan. 2004. Investigating and mitigating the electrocution of raptors in Tucson, Arizona. Annual Meeting of the Raptor Research Foundation. 10-13 November. Bakersfield, CA.
- **Dwyer, J.F.** and R.W. Mannan. 2004. Invited speaker. Investigating the electrocution of urban raptors. Edison Electric Institute, Avian Power Line Interaction Committee Annual Meeting. October. Tucson, AZ.
- **Dwyer J.F.**, and R.W. Mannan. 2004. The role of the community in preventing the electrocution of Tucson's Harris's hawks. Monthly meeting of the Tucson Audubon Society. March. Tucson, AZ.
- **Dwyer J.F.**, and R.W. Mannan. 2004. The use of nest sites as focal areas in preventing urban raptor electrocutions. Joint Annual Meeting of the Arizona and New Mexico Wildlife Societies. February. Safford, NM.
- **Dwyer, J.F.** 2003-2004. Raptor electrocution in Tucson—the current state of the research. Monthly or bimonthly presentations to the managerial, office, and field staff of the Tucson Electric Power Company. Tucson and Nogales, AZ.

Posters

- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. 2010. Discovery and Conservation Implications of Communal Roosts of Non-Breeding Caracaras. 26th Annual Virginia Tech Graduate Student Association Research Symposium. 24 March, Blacksburg, VA.
- **Dwyer, J.F.**, J.L. Morrison, J.D. Fraser. 2009. Use of breast plumage to age Crested Caracaras. The 127th Stated Meeting of the American Ornithologist's Union. 14 August, Philadelphia, PA.
- **Dwyer, J.F.**, N. Nemeth, J.L. Morrison, J.D. Fraser. Invited poster. 2009. West Nile and Encephalitis Surveillance. Virginia Council of Graduate Schools Fourth Annual Graduate Research Symposium. 10 February, Richmond, VA.
- **Dwyer, J.F.**, J.D. Fraser, and J.L. Morrison. 2008. Social biology of non-breeding Crested Caracaras in Florida. Society of Environmental Journalists 18th Annual Conference. 15-19 October, Roanoke, VA.
- **Dwyer, J.F.**, N. Nemeth, J.L. Morrison, J.D. Fraser. 2008. West Nile, Eastern Equine Encephalitis, and St. Louis Encephalitis Viruses in Crested Caracaras in Florida. Virginia Tech Dean's Forum on Infectious Diseases, 29 September, Blacksburg, VA.
- Nemeth, N., **J.F. Dwyer**, J.L. Morrison, J.D. Fraser. 2008. West Nile Virus in Florida's Crested Caracaras. Annual International Conference of the Wildlife Diseases Association, 3-8 August, Edmonton, Alberta, Canada.
- **Dwyer, J.F.**, J.D. Fraser, J.L. Morrison. 2007. Conservation of non-breeding Crested Caracaras in Florida. Virginia Tech Dean's Forum on the Environment, 27 February, Blacksburg, VA.
- **Dwyer, J.F.** and M. Culver. 2006. Buccal swabs yield PCR-amplifiable DNA in Harris's Hawks. IV North American Ornithological Conference, 3-7 October, Veracruz, Mexico.

Posters (cont.)

- **Dwyer, J.F.** and R.W. Mannan. 2006. Disappearance of raptor carcasses in an urban environment. American Museum of Natural History's Center for Biodiversity and Conservation Symposium on Conserving Birds in Human-Dominated Landscapes. 27-28 April, New York, NY.

Professional Memberships

- Raptor Research Foundation, 2006 – present (Peer reviewer 2008 – present, Scientific committee member 2010, Chair of scientific committee 2011 – present).
- The Wildlife Society, 2012 – present (Certified Wildlife Biologist).
- Cooper Ornithological Society, 2006 – 2008.
- American Ornithologists Union, 2009 – present.

Reporting

- **Dwyer, J.F.** 2010-2012. Assorted written and oral reports on behalf of EDM to:
- Anadarko Petroleum Corporation. Evaluation of raptor nesting and avian electrocution prevention at the Salt Creek oil field.
- Bureau of Land Management. Comparative study of the effectiveness of various avian perch deterrent systems for distribution power poles.
- California Energy Commission. Analysis of retrofitting measures and development of a logistic regression model of avian electrocution.
- Pepco Holdings Incorporated. Avian collision risk assessment for the Mid-Atlantic Power Pathway (MAPP).
- Powder River Energy Corporation. Avian collision risk assessment for transmission lines along Kluver Road.
- Poudre Valley Rural Electric Association. Evaluations of and retrofitting to prevent the electrocution of Bald Eagles.
- San Diego Gas & Electric. Avian collision quantification and adaptive management.
- Tri-State Generation and Transmission Association. Management of nesting by Chihuahuan Ravens on H-frame transmission structures.
- Yates Petroleum Corporation. Avian protection plan power line review.
- **Dwyer, J.F.** 2011-2012. Monthly and annual reports submitted to the Tri-State Generation and Transmission Company describing research on the effectiveness of a nest-diverter designed to prevent Chihuahuan Ravens (*Corvus cryptoleucus*) from nesting above the center phase of H-frame transmission structures.
- **Dwyer, J.F.** 2010-2011. Monthly reports submitted to the California Energy Commission-PIR describing research on the effectiveness of retrofitting activities to prevent the electrocution on Bald and Golden Eagles in CA.
- **Dwyer, J.F.**, Harness, R.E., and Nielsen, L. 2010-2011. Assorted final and interim reports to clients describing survey results, avian protection plans, and scientific analyses.
- **Dwyer, J.F.**, J.D. Fraser, J.L. Morrison. 2006-2009. Caracara gathering areas in Florida: Interim reports submitted each quarter. Annual reports submitted each fiscal year. Final report submitted May 2010. Fish and Wildlife Service grant agreement no. 401815G060.
- **Dwyer, J.F.**, and R.W. Mannan. 2003-2004. Harris's Hawk electrocution in Tucson. Interim reports submitted each quarter. Annual reports submitted each fiscal year. Final report submitted 30 May 2004. Arizona Game and Fish Department Heritage Grant # U03003.

Teaching Experience

- January 2010 – May 2010. Teaching Assistant, Virginia Tech. Biology 4404, 2 sections, Ornithology Lab.
- Pedagogy for Natural Resource Sciences (Teaching Instruction Received). 2008.
- August 2004 – December 2004. Teaching Assistant, University of Arizona. Biology 181, 2 sections, Introductory Biology Lab for science majors.
- January 2004 – May 2004. Teaching Assistant, University of Arizona. Wildlife and Fisheries Science 446, 1 section, Wildlife Conservation and Society for non- majors.

Recent Volunteer Work

- Raptor Research Foundation (RRF) September 2010 – Present
 - Title: Scientific Committee Chair
 - Supervisor: Ruth Tingay (Pres.)
 - Responsibilities: Solicit, review, approve, standardize, and format abstracts for presentations at the Raptor Research Foundation’s Annual meetings. Arrange oral and poster presentations in cohesive sessions. Coordinate moderators and symposia. Assist local committee in organizing and troubleshooting prior to and during conference. Moderate selected sessions. Represent RRF in organization of 5th North American Ornithological Conference.

- Government of Andalucia, Spain September 2012
 - Title: Avian Electrocutation Mitigation Consultant
 - Supervisor: Jose Rafael Garrido
 - Responsibilities: Conduct field assessment of avian retrofitting to mitigate avian electrocution risk. Identify areas where new retrofitting is needed and where existing retrofitting needs improvement. Provide a detailed presentation comparing dangerous structures in Spain with similar retrofitted structures in the U.S. Facilitate contact with U.S. manufacturers of retrofitting equipment, and explain the uses of that equipment.

- Falklands Conservation May 2010 – Present (intermittent)
 - Title: Adjunct Scientific Advisor
 - Supervisor: Craig Dockrill
 - Responsibilities: Create novel trap for use in capturing Striated Caracaras. Travel to Falkland Islands (Malvinas) to advise research team on capture, handling, and blood sampling for Striated Caracaras and Southern Crested Caracaras. Mentor project leader on scientific writing for grant applications, internal reporting, and peer reviewed publishing. Contribute to proposal for Darwin Grant (awarded £249,658).

- University of North Carolina June 2010 – July 2010
 - Title: Field Assistant
 - Supervisor: Ginger Winder
 - Responsibilities: Target net Nelson’s Sharp-tailed Sparrows at James Bay, Ontario. Navigate unfamiliar terrain using GPS, operate from tent-based backcountry campsite.

- Audubon North Carolina May 2007 – May 2010 (intermittent)
 - Title: Field Assistant
 - Supervisor: Angela Mangiameli
 - Responsibilities: Capture and collect morphometric data from various species of wintering salt marsh sparrows. Conduct nesting surveys for Piping Plovers, Common Terns, and other colonial shorebirds. Conduct boat-based occurrence surveys for American Oystercatcher. Operate outboard 19’ outboard boat to access survey sites.

Employment History

- Employer: EDM International Inc. September 2010 – present
 - Title: Environmental Scientist ○ Supervisor: Rick Harness
 - Responsibilities: Create and educate clients on avian protection plans to mitigate interactions between raptors and overhead electric power delivery systems. Evaluate avian collision risks on power lines. Develop a research program to investigate and mitigate avian collisions with overhead power lines. Hire train and manage survey crews of up to six technicians. Develop a research program to investigate methods of preventing nesting by ravens on H-frame transmission structures. Develop a research program to investigate relative effectiveness of perch deterrents on distribution structures. Test existing models of preventing avian electrocution on power lines. Conduct field assessments by foot, automobile, fixed wing aircraft, and helicopter in support of avian protection planning for collision and electrocution risks. Evaluate the effectiveness of mitigation strategies. Field work in California, Colorado, Delaware, Maryland, New Jersey, New Mexico, Nebraska, Texas, Utah, Virginia, Washington, Washington D.C., and Wyoming. Oral presentations in British Columbia, California, Colorado, Missouri, New Mexico, and Wisconsin. Beginning salary \$55 k/yr. Current salary available upon request.

- Employer: Eagle Environmental April 2008 – July 2010
 - Title: Adjunct Consultant ○ Supervisor: Dr. Joan Morrison
 - Responsibilities: Litigative consulting on avian-power line interactions. Work with South Florida Water Management District employees to develop trapping, tracking, and monitoring protocols for breeding Crested Caracaras. Salary \$50-\$150/hr. depending on assignment.

- Employer: Virginia Polytechnic Institute and State Univ. November 2005 – May 2010
 - Title: Ph.D. Candidate ○ Supervisor: Dr. Jim Fraser
 - Responsibilities: Secure external funding. Prepare dissertation for peer reviewed publication. Prepare quarterly and annual reports for submission to the USFWS. Hire and direct employees. Find, capture and radio-tag non-breeding Crested Caracaras. Conduct aerial telemetry to estimate home ranges, monthly survival, and habitat. Conduct behavioral observations to identify and test benefits of grouping. Recruit and manage temporary field technicians. Starting salary \$19.8 k/yr., ending salary \$23.2 k/yr.

- Employer: Greenwich Audubon / National Audubon Society August 2005 – October 2005
 - Title: Raptor Migration Counter ○ Supervisor: Madeline Dennis
 - Responsibilities: Count migrating raptors as they passed within sight of the Greenwich Audubon nature center. Educate visitors on raptor migration and biology. Upload daily reports to Hawk Watch Migration Association of North America web site.

- Employer: Tucson Electric Power Company, Tucson, AZ June 2004 – July 2005
 - Title: Consultant / Raptor Biologist ○ Supervisor: Joe Sheehy
 - Responsibilities: Identical to graduate research assistant position described below. I had all the data I needed to complete my Master's thesis. This contract facilitated ongoing data collection through a seamless transition to a new Master's student.

Employment History (cont.)

- Employer: University of Arizona, Tucson, AZ July 2002 – May 2005
 - Title: Graduate Research Assistant
 - Supervisor: Dr. Bill Mannan
 - Responsibilities: Find and monitor breeding groups of Harris's Hawks. Assemble database of all raptor nests in the Tucson area, and deliver to Arizona Game and Fish Dept., Tucson Electric Power Co. (TEP), and University of Arizona. Capture and band adult and nestling hawks, and determine primary mortality factors. Identify potentially lethal power poles, request retrofitting, evaluate retrofitting, and report results to TEP administration. Educate public and industry personnel on raptor biology and interaction with power structures through lectures and presentations, capturing and banding demonstrations, and home visits. Mediate misunderstandings between TEP and Tucson residents. Collect, extract, and analyze genetic material of captured hawks.

- Employer: University of Georgia, Athens, GA March 2002 – June 2002
 - Title: Field Technician
 - Supervisor: Brady Mattson
 - Responsibilities: Nest search, target-net and band Louisiana Waterthrush adults and young. Monitor territory boundaries, and nesting success. Film and analyze nesting activity. Design, build, and use Louisiana Waterthrush decoys.

- I enjoyed a birding tour of America's National Parks between employments with the University of Georgia and the Massachusetts Audubon Society. I volunteered at numerous migration banding stations and hunter check stations during that trip.

- Employer: Massachusetts Audubon Society, Yarmouth, MA May 2001 – August 2001
 - Title: Coastal Waterbird Technician
 - Supervisor: Matt Bailey
 - Responsibilities: Operate small boat on tidal water. Educate visitors on endangered and non-endangered plant and animal species. Identify and protect nests of Piping Plover, Least Tern, Common Tern, Roseate Tern, Spotted Sandpiper, and Willet.

- Employer: Plum Creek Timber Co., Seeley Lake, MT December 2000 – April 2001
 - Title: Biological Technician
 - Supervisor: Henning Stebbins
 - Responsibilities: Operate 4WD trucks with trailers. Operate and repair snowmobiles. Use Trimble and Magellan GPS devices. Ground-truth satellite imagery. Track Canada Lynx over snow by snowshoe. Identify and quantify vegetation using a combination of project specific and traditional forestry techniques.

- Employer: Massachusetts Audubon Soc., South Wellfleet, MA May 2000 – October 2000
 - Title: Research Assistant
 - Supervisor: Jackie Sones
 - Responsibilities: Wetland habitat restoration. Design and operate small mammal mark/recapture study. Monitor bird boxes with Cornell University nest box network program. Heathland bird point counts. Rare plant assessment/monitoring and collection of associated insects. Collect and pin of moths. Mark and radio track Eastern Box Turtles. Dragonfly and butterfly surveys. Use of Garmin GPS.

James F. Dwyer
Research Scientist

Employment History (cont.)

- Employer: University of Montana and U.S.F.S., Missoula, MT June 1999 – August 1999
 - Title: Field Volunteer
 - Supervisor: Ty Smucker
 - Responsibilities: Set and monitor small mammal live traps. Ear tag, weigh and sex captured animals. Radio telemeter Canada Lynx. Navigate by compass and topographical map through mountainous and unfamiliar terrain. Collect vegetation and environmental data.

- Prior to June 1999 (Non-wildlife)
 - Information on prior employment in the fields of fisheries, adjudicated youth, electronics, photography, industrial machining, and customer service is available upon request.

Additional Supporting Materials Available

- Transcripts from the University of Montana, University of Arizona, and Virginia Tech. PDF versions of publications, dissertation, thesis, and professional posters.

References

- Industry references are available from EDM International, Inc., the Tucson Electric Power Company, Tri-State Generation and Transmission Assoc. Inc., and others.
- Academic references are available from the University of Arizona, Trinity College, and Virginia Tech.
- Agency references are available from the State of Arizona, the State of Florida, and the United States Fish and Wildlife Service.
- References from volunteer positions, and less recent employers are also available.

Literature Cited

- APLIC (Avian Power Line Interaction Committee) 2006. Suggested practices for avian protection on power lines: the state of the art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, CA.
- Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service (APLIC and USFWS). 2005. Avian protection plan (APP) guidelines. Edison Electric Institute, Washington, D.C.
- Barrientos, R., J. C. Alonso, C. Ponce, and C. Palaćin. 2011. Meta-analysis of the effectiveness of marked wire in reducing avian collisions with power lines. *Conservation Biology* 25:893-903.
- Barrientos, R., C. Ponce, C. Palaćin, C. A. Martín, B. Martín, and J. C. Alonso. 2012. Wire marking results in a small but significant reduction in avian mortality at power lines: a BACI designed study. *PLoS ONE* 7:e32569.
- Brown, W. M., and R. C. Drewien. 1995. Evaluation of two power line markers to reduce crane and waterfowl collision mortality. *Wildlife Society Bulletin* 23:217-227.
- Dwyer, J. F. 2004. Investigating and mitigating raptor electrocution in an urban environment. Master's thesis. University of Arizona. Tucson, AZ.
- Dwyer, J. F. 2006. Electric shock injuries in a Harris's hawk population. *Journal of Raptor Research* 40:193-199.
- Dwyer, J. F., and R. W. Mannan. 2007. Preventing raptor electrocutions in an urban environment. *Journal of Raptor Research* 41:259-267.
- Dwyer, J.F. 2009. Raptor electrocution: A case study on ecological traps, sinks, and additive mortality. *Journal of Natural Resources and Life Science Education*. 38:93-98.
- Dwyer, J.F., and K. Doloughan. In press. Testing systems of avian perch deterrents on electric power distribution poles. *Human-Wildlife Interactions*.
- Dwyer, J.F., and D.L. Leiker. 2012. Managing nesting by Chihuahuan Ravens on H-frame electric transmission structures. *Wildlife Society Bulletin*. 129. Available online at: <http://onlinelibrary.wiley.com/doi/10.1002/wsb.129/abstract>
- Dwyer, J.F., and R. E. Harness. 2012. Evaluating the Effectiveness of Avian Interaction Mitigating Measures and Processes. California Energy Commission. Publication number: CEC-PIR-08-026.
- EDM (EDM International, Inc.). 2012. Avian Protection Plan Ameren. EDM International, Inc. Fort Collins, CO, USA.
- Harness, R.E. and J.F. Dwyer. 2011. Field guide: Visual inspection of avian issues on transmission and distribution structures. Electric Power Research Institute product ID number pending. Palo Alto, CA.
- Janss, G.F.E., and M. Ferrer. 1998. Rate of bird collision with power lines: effects of conductor-marking and static wire-marking. *Journal of Field Ornithology* 69:8-17.
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- Morkill, A. E., and S. H. Anderson. 1991. Effectiveness of Marking Powerlines to Reduce Sandhill Crane Collisions. *Wildlife Society Bulletin* 19: 442-449.
- Murphy, R.K., S.M. McPherron, G.D. Wright, and K.L. Serbousek. 2009. Effectiveness of avian collision averters in preventing migratory bird mortality from powerline strikes in the central Platte River, Nebraska. Final Report to the USFWS.
- Poole, A.F., L.R. Bevier, C.A. Marantz and B. Meanley. 2005. King Rail (*Rallus elegans*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology
- Rollan, À., J. Real, R. Bosch, A. Tintó, and A. Hernández-Matías. 2010. Modelling the risk of collision with power lines in Bonelli's Eagle *Hieraetus fasciatus* and its conservation implications. *Bird Conservation International* 20:279-294.
- Shaw, J.M., A.R. Jenkins, J.J. Smallie, and P.G. Ryan. 2010. Modelling power-line collision risk for the blue crane *Anthropoides paradiseus* in South Africa. *Ibis* 152:590-599.
- Sporer, M.K., J.F. Dwyer, B.D. Gerber, R.E. Harness, and A.K. Pandey. *In press*. Marking power lines to reduce avian collisions near the Audubon National Wildlife Refuge, North Dakota. *Wildlife Society Bulletin*.
- USFWS (U.S. Fish and Wildlife Service). 2013a. Migratory bird flyways. Accessed online at: <http://www.fws.gov/migratorybirds/Flyways.html>
- USFWS (U.S. Fish and Wildlife Service). 2013b. Mississippi flyway. Accessed online at: <http://mississippi.flyways.us/>
- Ventana Wildlife Society. 2009. Evaluating diverter effectiveness in reducing avian collisions with distribution lines at San Luis National Wildlife Refuge Complex, Merced County, California. California Energy Commission, PIER Program. CEC-500-2009-078.
- Yee, M.L. 2008. Testing the effectiveness of an avian flight diverter for reducing avian collisions with distribution power lines in the Sacramento Valley, California. California Energy Commission, PIER Energy-Related Environmental Research Program. CEC-500-2007-122.