# THE BIOLOGICAL RESOURCES AND ECOLOGICAL IMPORTANCE OF THE LABYRINTH CANYON AREA, AND NEED FOR PROTECTION

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The Labyrinth Canyon Region of the Colorado Plateau, along with is tributaries, encompasses a highly biodiverse area with outstanding wildlife habitat and rich ecological assemblages. There are substantial threats currently acting on this area so rich in ecological treasures, which would be greatly reduced if this unit of the Red Rock Wilderness Act is protected as Wilderness in Rob Bishop's Land protection initiative.

**Flora of the proposed Labyrinth Canyon wilderness unit**. Highly variable geography, geology and soil types that result from unique geological formations, coupled with an elevation range between 3,500 to 6,000 feet; result in a high diversity of ecotypes including but not limited to the salt desert shrub, lush grasslands, and pinyon-juniper forests of the Labyrinth Canyon region. The flora of the Labyrinth Canyon region is considered to be part of the Canyonlands Floristic Province, which possesses greater plant diversity than any other floristic region in Utah (Cronquist et al. 1972, Davidson et al. 1996). Hundreds of different species of plants can be found in the Labyrinth Canyon Region – which comprises a significant percentage of the plants known to the Colorado Plateau Ecoregion (Albee et al. 1988).

Additionally, high rates of endemism occur in this region, which is linked to the many unique features of this province, including climate, position along plant migratory routes, and distinctive geologic history (Welsh 1978). Conditions for growth on the unique substrates and stark formations of this part of the Colorado plateau are often rigorous at best, limiting the number of plants capable of establishment and reproduction in any given area (Davidson et al 1996). Small populations of unique plants that have evolved in relative isolation are the result of these unique habitat conditions. Some of these small populations represent rare species occurrences that they are easily imperiled by any ground disturbing activities and/or human actions such as ORV use and non-native species introduction due to their existing vulnerabilities, including low reproductive potential, restricted geographic ranges, and substantial fluctuations in numbers within small populations. Some of these species are protected as federally Threatened or Endangered species (e.g. dwarf bearclaw poppy, clay phacelia, and clay reed mustard). Importantly, 21 federally listed Endangered and Threatened plant species can be found in the Greater Canyonlands region encompassing the Labyrinth Canyon proposed wilderness unit (UDWR NHP 2011). These species often have low reproductive potential, restricted geographic ranges, or typically experience substantial variation in population size, all of which make them highly vulnerable to human disturbance.

In Labyrinth Canyon, Bowknot Bend protects an isolated relict plant community that remains unaltered by human activity and livestock grazing. This location has the potential to serve as reference (or control) site for scientific studies of adjacent vegetation communities that incur impacts of livestock grazing (normally considered to be a near ubiquitous impact to most plant communities of the intermountain West). The natural history values in this area are recognized by BLM as it is currently representative of a fairly pristine native plant community. In fact this 1,080 area of Bowknot Bend has been designated by the BLM as an Area of Critical Environmental Concern (BLM Price F.O RMP). Additionally, the Labyrinth Canyon region encompasses numerous steep-walled mesa tops that are virtually inaccessible and as such, have been predominantly isolated from anthropogenic disturbances (including livestock grazing). This has resulted in multiple areas of relict plant populations, some of which have existed since the Pleistocene, where natural processes continue unaltered by humans. As witnesses to the past, these pristine areas establish a baseline against which to measure changes in species composition, community dynamics and biogeochemical cycles in adjacent areas impacted by human activities.

Fragile biological soil crusts play a critical role throughout the Labyrinth Canyon area. These crusts increase the stability of otherwise easily erodible soils, increase water infiltration in a region that receives limited precipitation, and increase fertility of xeric soils often limited in essential nutrients such as nitrogen and carbon (Johansen 1993, Belnap et al. 1994). Studies examining the crucial ecosystem functions performed by biological soil crusts (some of which have been conducted not far from Labyrinth Canyon (Belnap and Sharpe 1995, Miller et al. 2001, Barger at al. 2005, Goldstein et al. 2009), have documented the negative consequences that ensue in cases where the crusts have been destroyed; including the primary impacts of reduced soil stability and fertility.

**Wildlife of Labyrinth Canyon region**. The diverse plant communities of the Labyrinth Canyon region support a diverse wildlife community of birds, mammals, fish, reptiles, and invertebrates. This includes species on the Utah Division of Wildlife Resource’s list of Species of Greatest Conservation Need, such as white-tailed prarie dog, kit fox and Townsend’s big-eared bat (UDWR 2001, 2015). The Green River through Labyrinth Canyon also includes a suite of rare desert fish, ranging from fish species on Utah’s list of Species of Greatest Conservation Need like roundtail chub, bluehead sucker and flannelmouth sucker, to the four federally endangered Coloarado river fish that could all potentially be found in this stretch of the Green: the Colorado pikeminnow, humpback chub, bonytail chub and razorback sucker (UDWR 2001, 2015). In addition, the Utah Division of Wildlife Resources reports that the west side of the Labnyrinth proposed wilderness unit contains Crucial pronghorn habitat (UDWR 2010), and that Substantial desert bighorn habitat can be found to the south of the unit, and Crucial bighorn habitat can be found on the north end (UDWR 2008). Concentration areas of biodiversity or biological 'hot spots' for both wildlife and plants include the mainstem of the Green River and its tributaries throughout the Labyrinth Canyon proposed wilderness unit, where countless songbirds, shorebirds, and migratory waterfowl depend upon the river as a stopover point in their long journeys north and south.

Raptor habitat which includes nest sites, foraging areas and roosting sites are common in and around the Labyrinth Canyon region. Riparian habitat such as that found along the Green River and its tributaries supports the greatest diversity and number of prey species, thus providing the greatest food supply for raptors. Raptors using the area include bald eagles (primarily they use wintering habitat along the Green River), and (reintroduced) peregrine falcons who nest on the steep cliffs above Labyrinth Canyon. Ferruginous hawks are active nesters in this region, often nesting on the ground of mesa tops. Ferruginous hawks also favor open terrain where they are vulnerable to human impacts. Swainsons' hawks are seen flying through Labyrinth Canyon as they migrate between nesting areas to the north and winter areas in South America.

**River corridor, riparian zones and wetland values of the Labyrinth area**. Most of these fish and wildlife species rely on healthy, free-flowing watercourses and associated functioning and connected riparian areas along them at some stage of life history and development. Significantly, while riparian ecosystems make up less than one percent (1%) of all public lands managed by the Bureau of Land Management (BLM) in Utah, they support 70-80% of Utah's arid land plants and wildlife species (Schelz 2007). The Labyrinth Canyon region contains over 53miles of perennial watercourses, including the Green River (USGS 2011a), which support perennial riparian vegetation, and over 700 miles of intermittent stream courses (USGS 2011a) such as Tenmile Wash and White Wash, which have continuous surface flows during wet times of the year such as spring and fall; however, during dry periods they may be intermittent with perennial sections and pools. Either way, these intermittent streams generally have, or have the potential to have, desert riparian vegetation composed of cottonwood and willows and a host of other typical riparian/wetland plants, offering important habitat to wildlife and even some aquatic species (Schelz, 2007).

Stream-riparian ecosystems are among the most biologically diverse, productive, and threatened habitats in the American Southwest (Johnson 1991, Stromberg 1993, Minckley and Brown 1994). Riparian habitats on the Colorado Plateau support diverse and unique assemblages of species not found elsewhere, as well as many facultative species from the surrounding uplands (Stacey 1995, Naiman and Decamps 1997, Sabo et al. 2005). Riparian ecosystems within the Labyrinth Canyon region act as important migration corridors for larger species such as deer, mountain lions and bears (Belnap 1997). They provide temporary, or permanent, connections to outlying wetland pockets that provide auxiliary nurseries for a variety of invertebrates, amphibians, and larval and immature native fish (Wolz and Shiozawa 1995, Davidson et al. 1996). These systems also provide refuges and stopovers for neotropical migrant birds within otherwise dry and inhospitable habitat (Moore 1990). Riparian corridors are natural attractants to recreational users and are easily disturbed by human activities ranging from motorized and non motorized recreation, to dams and water diversions. Because riparian sites are often relatively isolated from similar habitat in riparian zones associated with a different drainage, their recovery from disturbance is likely to be hindered by the difficulty of recolonization from other drainages.

In the Labyrinth Canyon region there are 36 perennial springs in this otherwise dry landscape (USGS 2011b). In the Labyrinth area, springs are formed when sandstone formations that store water bond with less permeable layers leading to seeps and springs where they meet. Some of the rarest species in Utah and the most spectacular biotic assemblages are those associated with the springs and seeps that dot the landscape in this region. Just as areas with distinctive soil types are inhabited by their own special floras, the uniqueness of spring and seep habitats usually translates into unusual species communities, including “hanging gardens” (Rushforth et al. 1976, Johansen et al. 1983). Further, because these springs are generally isolated from other springs and seeps, their recovery from any form of disturbance is likely to be impeded markedly by the difficulty of recolonization from similar habitats that may be miles away. Moreover, seeps, springs and hanging gardens provide crucial habitat for a variety of wildlife, ranging from important stop-over habitat for neotropical migrants, to essential habitat for resident vertebrates – especially amphibians - who use these areas for foraging and breeding. Because these communities are often unique and difficult or impossible to replace, they merit the strongest possible protection.

**Rare and unique dune systems in Labyrinth proposed wilderness unit**. Located between the Green River tributaries of Salt Wash and Tenmile Wash are the White Wash Sand Dunes, a semi-active, longitudinal dune about ½ mile wide and 2.5 miles long. This dune system is the result of eolian, or wind-blown, deposits derived from wind-transported sand from the San Rafael Desert to the West. The sands of the dunes are very fine, and as such have very high water holding capacity, which is turn leads to a perched water table. This phenomena allows for Freemont cottonwoods and coyote willows to grow on the tops of the dunes… well above the water table represented by White Wash and emerging springs in the bottoms and along the outskirts of the dunes. This is a very unusual phenomenon (Bowers 1984, personal communication Stan Welsh, BYU Herbarium). Available water for these hydrophytic plants is drawn up by the plants through capillary action into the roots, rather than a direct connection to a water table (personal communication Stephanie Ellingham, Moab BLM, November 2004).

Currently, the White Wash Sand Dunes experience heavy traffic by off-road recreational vehicles (ORV). Historically, parts of the White Wash dunes were held in place by a thin, chemical crust, comprised inorganically (i.e. weather and rainfall),[1] but perhaps with some further stabilization by cyanobacteria. Traces of this mechanical crust are observable on the White Wash dunes today. However, most locations where this crust still exists is torn up and crossed by ORV tracks (personal observation, ALJ). In addition, there is evidence of limited willow and cottonwood recruitment on the dunes, likely because of the ORV use (personal observation, ALJ). Dunes are particularly fragile and are easily impacted by even light motorized use (Biodiversity Conservation Alliance 2003). Dune buggies and sand rails, whose tires can cut deeply into the sand even when accelerating on level ground (Stebbins 1995) pose significant threats to the stability of sand dunes. These specialized tires throw up large rooster tails of sand, which in the process causes loss of precious soil moisture (which is one of the more unique factors of the White Wash Dunes). The integrity and viability of any sand dune ecosystem depends on the balance of sand deposition and sand loss. Typically a portion of dunes are actively accumulating sand, a portion are stabilized, and a portion are actively eroding and losing sand due to wind. While some dune systems can be partially stabilized by abiotic soil crusts, the chief cause of stabilization is anchoring by vegetation. ORV use in sand dunes can cause major destruction of dune plant communities, including significant impacts to diversity and richness of dune vegetation (Bury and Luckenback 1983, Kutiel et al. 2000, Center for Biological Diversity 2004). Thus, ORV use in sand dunes leads to dune destabilization and eventual loss of dune area. Dune buggies and sand rails also pose significant threats to many species of animals that live in dune ecosystems. For dune-specific fauna such as sand beetles, ORVs pose a particularly significant threat. Hardy and Andrews (1980) report that most dune beetles spend the day buried at a depth of 5 to 8 cm. This depth is not sufficient to protect individuals from the shearing activity of dune buggies, sand rails and other vehicle tires (Stebbins 1995). Burrows of lizards and small mammals can also be crushed by the deep digging action of paddle tires. And ground-nesting bees have nests that are often

[1] Since precipitation can help create these physical crusts (Jayne Belnap, unpublished manuscript), areas such as the White Wash Dunes that receive very little precipitation are less likely to often harbor these helpful physical crusts.

shallow and can be crushed or exposed by ORV activity. Moreover, ORVs can destroy bee nest entrances and manipulate or destroy visual landmarks bees use to locate nests when they return from foraging (personal communication Terry Griswold, USU Bee Lab).

**The Ecological uniqueness of Tenmile Canyon.** Tenmile Canyon is an extensive riparian/wetland canyon located approximately 20 miles southeast of Green River, Utah. It drains parts of the Cisco Desert and the Book Cliffs areas and flows west into the Green River. Tenmile Canyon is unique because it is one of the most extensive drainages south of Green River, Utah, that drains into the Green River from the east and contains perennial pools and surface flow for much of the year. As such, there are areas that have extensive functioning riparian systems that provide good habitat needs for fish and wildlife (including federally listed species like migrating southwestern willow flycatchers) that is not otherwise available in the area. (Schelz, 2007). In addition, there is a group of desert bighorn group that live in Tenmile Canyon area that likely rely on the stream and riparian habitat in Tenmile Canyon for food, water and shelter.

Tenmile Wash's riparian areas has been designated as "Non-Functional" or Functioning-at-Risk" by both the BLM and by ecological consultants, and this low functionality rating is a direct result of thr presence of the existing dirt road in the Canyon, and Off-Road Vehicle activity, specifically, many stream crossings by ORVs (Schelz, 2007). In fact, the stream channel used to naturally meander before the streambanks suffered massive degradation at the hand of ORVs and the stream itself got repeatedly diverted onto the straighter 4-wheel drive routes during flood events. After floods scour and deepen the straightened stream channel, a new 4-wheel drive route is often created by visitors or the BLM, and then these new routes start the degradative process all over with the next large flood (with the likelihood of the next flood being even worse because of increased flood energy with straighter channels and lack of banks). Thus, water is then channeled quickly through the system, deepening the channel even more and decreasing the likelihood of flooding out into the floodplain, with even more concomitant impacts to the ecosystem (Schelz, 2007). Basically, the use of dirt roads in Tenmile Canyon, even when the roads are distant from the strem channel, has led to a sparsity of regenerating shrubs (in contrast to the higher levels of shrub regeneration away from roads), a reduction and elimination of ground cover of native grasses, rushes and forbs, and the presence of undesirable exotic plants. (Schelz, 2007).

**Threats in Labyrinth Canyon area that would be alleviated if this unit protected as wilderness**.
One good reason to protect the Labyrinth Canyon unit as wilderness is to ensure that some of the energy related speculation activites of days past, such as uranium and potash mining, will not come back to

degrade this area. Potash mining currently occus in locations relatively nearby the Labyrinth Canyon area. Where potash mining occurs, the landscape may be disturbed through the removal of topsoil and vegetation, excavation and deposition of overburden, disposal of processing wastes and underground mining induced surface subsidence. The quality of surface and groundwater may be adversely affected by the release of processing water and the erosion of sediments and leaching of toxic minerals from overburden and processing wastes. Water resources may be affected by dewatering operations or beneficiation processes. Air quality can be affected by the release of emissions such as dust and exhaust gases (UNEP 2001).

As evidenced with the White Wash Sand Dunes and Tenmile Canyon example,[2] one of the most pervasive, current threats to the special desert ecosystems found in the Labyrinth Canyon area is ORV use. And while, as discussed above, ORV use in desert environments can have serious impacts in terms of impacts to rare dune environments, trampling vegetation, altering wildlife behavior, and causing soil erosion (Jones 1999), one of the most insidious threats ORVs have on the fragile Colorado Plateau is the impacts to the important biological crusts (also mentioned above). ORVs are incredibly descutive to these crusts, even a single pass of an ORV causes noticeable damage. And once they are destroyed they take a very long time to recover. The recovery time for the lichen component of crusts has been estimated at about 45 years (Belnap 1993) but the 45 year-old crusts will not have recovered their moss component, which will take an additional 200 years to fully come back (Belnap and Gillette 1997). Destruction of crusts by ORVs increase wind and water erosion of surface soils that were previously protected by the crusts (Webb 1983). The destruction of cryptobiotic soils can reduce nitrogen fixation by cyanobacteria, and set the nitrogen economy of these nitrogen-limited arid ecosystems back decades (Belnap 1995). Once the intact crusts - which prohibit weed establishment by preventing weed seed germination - are destroyed, bare ground is available and “roughed up” for colonization and germination by exotic weeds (Tisdale and Hironaka 198, Eckert et al. 1986, Mack 1989, Belsky and Gelbard 2000). Even small reductions in crusts can lead to diminished productivity and health of the associated plant community, with cascading effects on plant consumers (Davidson et al. 1996). In summary, healthy and intact cryptobiotic crust communities are now rare in this part of the Colroado Plateau , and so their intact occurrence anywhere within the Labyrinth Canyon area underscores one of the most important ecological values of this region. We must preserve what we have left and help these rare and important

[2] ORV use in the Labyrinth Canyon Area is by no means limited to TenMile Canyon and the White Wash Dunes. For example, ORV use is also causing problems on the road into and inside Hey Joe Canyon.

habitats recover to higher levels of ecological function, and protecting the Labyrinth Canyon unit from ORV use through Wilderness designation is probably the very best way to achieve this protection. Doing so could remove ORVs from the better part of what is now over 500 collective miles of routes, ways and dirt roads in the Labyrinth Canyon proposed wilderness unit (Utah AGRC 2014), alleviating many destructive impacts to riparian zones, cryptibiotic soils, sand dunes, and other sensitive plant communities.

**General biological importance of protecting large blocks of roadless lands as wilderness** The science of conservation biology in the past few decades has, through empirical research, conclusively shown us that one of the best rates of return in terms of preserving biodiversity and sustaining critical ecological processes is through the conservation of large, roadless tracts of habitat (Noss and Cooperrider 1994, Review by Trombulak and Frissell 2000, and references therein). This is achieved by protecting rare and susceptible native plant and wildlife species and their associated habitats from anthropogenic disturbances including: plant collectors, hunters, and poachers who access areas on roads; noise (human and mechanical); ORVs that illegally degrade habitat by crossing pristine areas from roads; aggressive exotic weeds that tend to colonize undisturbed habitat along roads; and pollution and erosion caused by roads and thus affecting the watershed. Preserving the Labyrinth Canyon area as an intact roadless wilderness unit is vital to ensuring these aforementioned impacts on the critical ecological qualities of this special and biologically diverse landscape are minimized to the extent possible.

**Conclusions**. Protection of the Labyrinth Canyon area as wilderness is vital to preserving it’s ecological treasurers and Utah’s natural heritage. Managing this area primarily for its outstanding natural values will improve this region’s ecological health, function, and most importantly its ecological resilience, or rather - the ability to “bounce back” from the increased droughts expected with climate change, which is predicted to accelerate desertification in the Colorado Plateau (Schwinning et al., 2008). As Biologists who study the ecology and function of this remarkable area, we ask the Grand County Council to put forward the full Labyrinth Canyon proposed wilderness unit for the protection it deserves, and to seek this protection as part of Rep. Bishop’s new land initiative.

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