

Mr. Wayne Lee
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Re: *Devil's Gate Reservoir Restoration Project – Phase 2 Restoration Qualitative Monitoring Conducted on January 20, 2022*

1.0 INTRODUCTION

The purpose of this letter report is to document the results of qualitative (horticultural) monitoring conducted for the Devil's Gate Reservoir Restoration Project (Project), located in the City of Pasadena, Los Angeles County, California. The qualitative monitoring was conducted in the planted and or seeded portions of the Phase 2 mitigation areas including DG-W-1 (Johnson Field), DG-2, DG-2 New Channels, DG-2 WOUS, DG-W-2 (Mining Pit), DG-W-2 Outlet, DG-4 Sheet Flow (northern), and DG-SF-1. Other areas included in Phase 2 include DG-4 Sheet Flow (southern), DG-4 WOUS, DG-4 Drainage, and DG-SF-2; however, due to the dynamic nature of these areas and/or uncertainty of hydrologic conditions prior to the completion of sediment removal for the Project, these areas were not planted or seeded during Phase 2. It is anticipated that most, if not all, of these areas will be planted with willow (*Salix* sp.) and mulefat (*Baccharis salicifolia*) stakes during the fall and winter of 2021/2022. The monitoring is being conducted in accordance with the Final Habitat Restoration Plan for the Project (HRP). Active sediment removal has been completed within the sediment removal areas for the Project and habitat restoration is being conducted onsite around the perimeter of the sediment removal areas.

ECORP is responsible for conducting qualitative monitoring and compliance review of restoration efforts in each of the mitigation areas. ECORP is also responsible for preparing monitoring reports, which typically include the following information:

- Overall health of container plants
- Observations and recommendations related to container plant establishment
- Germination of native plant species from seed application and natural recruitment
- Level of germination of nonnative plant species
- Soil condition

- Other observations and recommendations as appropriate

Qualitative monitoring was conducted by Carley Lancaster on January 20, 2022. Field data collected during the monitoring event is provided as Attachment A. This report documents the fifth monthly qualitative monitoring visit for the Phase 2 mitigation areas.

2.0 PEP MONITORING IN THE PHASE 2 MITIGATION AREAS

2.1 Brief Summary of Plant Installation

During the Phase 2 Installation effort, which was completed on May 5, 2021, a total of 11,440 one-gallon container plants were installed in the DG-W-1 (Johnson Field), DG-W-2 (Mining Pit), DG-W-2 Outlet, DG-2, DG-2 New Channels, DG-2 WOUS, DG-4 Sheet Flow (northern), and DG-SF-1 mitigation areas. Container plants were not installed in the DG-4 Sheet Flow (southern), DG-4 WOUS, DG-4 Drainage, or DG-SF-2 mitigation areas; however, these areas were included in the weed removal effort and will be planted with willow and mulefat stakes in the fall and winter of 2021. Table 1 lists container plant species and the numbers installed in each of the Phase 2 mitigation areas.

Scientific Name	Common Name	DG-					TOTAL
		DG-W-1 (Johnson Field)	DG-2/ DG-2 New Channels/ DG-2 WOUS	DG-W-2 (Mining Pit)	DG-W-2 Outlet	DG-4 Sheet Flow/ DG-SF-1	
<i>Artemisia douglasiana</i>	Mugwort	349	448	187	50	31	1,065
<i>Baccharis pilularis</i>	Coyote brush	349	375	187	50	31	992
<i>Baccharis salicifolia</i>	mulefat	673	827	228	61	37	1,826
<i>Populus fremontii</i>	Fremont's cottonwood	349	375	187	50	31	992
<i>Rosa californica</i>	California rose	349	375	187	50	31	992
<i>Rubus ursinus</i>	California blackberry	349	375	141	38	23	926
<i>Salix gooddingii</i>	Black willow	698	896	373	101	61	2,129
<i>Salix laevigata</i>	Red willow	349	375	187	50	31	992
<i>Salix lasiolepis</i>	Arroyo willow	349	375	187	50	31	992
<i>Sambucus mexicana</i>	Mexican elderberry	175	225	94	25	15	534
Total		3989	4646	1958	525	322	11,440

All plants were installed according to the methods described in Section 4.11 of the HRP. Planting holes for all container plants were dug to a width twice the size of the root ball and to a depth slightly deeper than the depth of the root ball so that the root crown was one inch below grade following installation. Prior to installation, all plants were thoroughly watered in their containers and the soil in planting holes was wetted with at least one gallon of water. Planting holes were backfilled with native soil and irrigation basins, approximately two feet in width, were formed around the base of each plant. Rocks greater than

two inches in diameter were removed to the extent possible from the backfill soil. All container plants were irrigated with at least one gallon of water immediately following installation and basin creation.

2.2 Qualitative Monitoring Methods

Qualitative monitoring occurs monthly following the 120-day Plant Establishment Period (PEP) for the remainder of Year 1 (8 months). Following Year 1, qualitative monitoring will occur quarterly during Years 2 and 3 and twice per year during Years 4 through 10. The purpose of the qualitative monitoring is to assess container plant health and vigor and monitor the success of the mitigation areas.

During the January 20, 2022 visit, all Phase 2 mitigation areas were walked, the health and vigor of container plants were documented, germination from seeding and natural recruitment was noted, and the irrigation lines were inspected for functionality. In addition, the level of nonnative and invasive weed cover was estimated for each of the Phase 2 mitigation areas.

2.3 Qualitative Monitoring Results

2.3.1 DG-W-1 (Johnson Field)

The overall health of the container plants in DG-W-1 was noted as being good. Approximately five percent of the container plants in DG-W-1 were noted as showing varied levels of stress and a negligible number were noted as being dead or missing. This is approximately the same percentage of plants that were showing stress during the last monitoring event. Stress may be occurring as a result of 1) transplant shock 2) herbivory by rabbits or other wildlife, 3) competition from nonnative and invasive weeds, 4) misplaced emitters, or 5) recreational traffic through the mitigation areas. Some of the willows (*Salix* sp.) and Fremont's cottonwoods (*Populus fremontii*) were showing signs of seasonal dieback. Formal mortality counts were taken for DG-W-1 during the 2021 quantitative monitoring and were included in the 2021 annual reporting. Some of the container plants were noted as lacking well defined basins and should have their basins properly constructed and/or repaired. The irrigation line appeared to be functioning properly during the monitoring visit. Evidence of pooling during the last storm event, including presence of heavily saturated soils, was observed in the northeast corner and the center of the DG-W-1 mitigation areas. The installation of plants in the DG-W-1 mitigation area appears to have been completed successfully. The current issues identified during the monitoring visit are not expected to have an effect on the continued growth of the plants in the mitigation area. Photos 1 and 2 in Attachment B document the mitigation area during the monitoring visit.

Native plant growth was noted throughout the DG-W-1 mitigation area, but what was present is likely from both natural recruitment and from seeding. Native plants such as common yarrow (*Achillea millefolium*), mugwort (*Artemisia douglasiana*), tarragon (*Artemisia dracunculus*), mulefat (*Baccharis salicifolia*), California poppy (*Eschscholzia californica*), and caterpillar phacelia (*Phacelia cicutaria*) were observed sprouting in the DG-W-1 mitigation area. It was noted that the dodder (*Cuscuta* sp.) observed growing on some of the young container plants during previous monitoring visits had been removed. Native cover was estimated to be approximately 25 percent in the DG-W-1 mitigation area.

Nonnative weed cover in DG-W-1 was estimated at less than five percent, which is approximately the same level of weed cover that was observed during the previous monitoring visit. Nonnative species observed in DG-W-1 included black mustard (*Brassica nigra*), poison hemlock (*Conium maculatum*), and red-stemmed filaree (*Erodium cicutarium*). Most of the nonnative weeds observed in this mitigation area are still vegetative and just beginning to germinate.

2.3.2 DG-2/DG-2 New Channels/DG-2 WOUS

The overall health of the container plants in DG-2, DG-2 New Channels, and DG-2 WOUS was noted as being good. Approximately ten percent of the container plants were noted as showing varied levels of stress and a negligible number were noted as being dead or missing. This is approximately five percent more than the percentage of plants that were showing stress during the last monitoring event. Stress may be occurring due to similar reasons described for DG-W-1. Similar to DG-W-1, some of the willows and Fremont's cottonwoods were showing seasonal dieback. Formal mortality counts were taken for DG-2, DG-2 New Channels, and DG-2 WOUS during the 2021 quantitative monitoring and were included in the 2021 annual reporting. Some of the container plants were noted as lacking well defined basins and should have their basins properly constructed and/or repaired. The irrigation line appeared to be functioning properly during the monitoring visit. Evidence of flow during the last storm event, including heavily saturated soils, sediment deposits, and debris deposits, was observed in DG-2 New Channels and DG-2 WOUS during the monitoring event; however, evidence of inundation during water holding activities behind the Devil's Gate Dam (Dam) was not observed. Flow appeared to be most significant at the southern extent of DG-2 WOUS and the small amount of erosion that was noted during the previous monitoring event at the terminal end of DG-2 WOUS, where the channel connects to the reservoir, was observed to be worsening. The installation of plants in the DG-2, DG-2 New Channels, and DG-2 WOUS mitigation areas appears to have been completed successfully. The current issues identified during the monitoring visit are not expected to have an effect on the continued growth of the plants in the mitigation area. Photos 3 through 6 in Attachment B document the mitigation areas during the monitoring visit.

Native plant growth was noted throughout the DG-2, DG-2 New Channels, and DG-2 WOUS mitigation areas, likely from both natural recruitment and from seeding. Native plants such as mugwort, tarragon, mulefat, caterpillar phacelia (*Phacelia cicutaria*), common phacelia (*Phacelia distans*), and ladies' tobacco (*Pseudognaphalium californicum*) were observed sprouting in the mitigation areas. It was noted that the dodder observed growing on some of the young container plants during previous monitoring visits had been removed. Native cover was estimated to be approximately 45 percent in the DG-2, DG-2 New Channels, and DG-2 WOUS mitigation areas.

Nonnative weed cover in the DG-2, DG-2 New Channels, and DG-2 WOUS mitigation areas was estimated at approximately five percent which is approximately the same percentage that was observed during the last monitoring visit. Nonnative species observed included black mustard, poison hemlock, and perennial pepperweed (*Lepidium latifolium*). Most of the nonnative weeds observed in this mitigation area were vegetative and just starting to germinate.

2.3.3 DG-W-2 (Mining Pit)

The overall health of the container plants in mitigation area DG-W-2 was noted as being good. Approximately ten percent of the container plants were noted as showing varied levels of stress and a negligible number were noted as being dead or missing. This is approximately the same percentage of plants that were showing stress during the last monitoring event. Stress may be occurring due to similar reasons described for DG-W-1. Formal mortality counts were taken for DG-W-2 during the 2021 quantitative monitoring and were included in the 2021 annual reporting. Some of the container plants were noted as lacking well defined basins and should have their basins properly constructed and/or repaired. The irrigation line appeared to be functioning properly during the monitoring visit. Evidence of flow through the channel in DG-W-2, including sediment deposits and debris buildup, was observed during the monitoring visit. In addition, Nature's Image indicated that the mining pit area was inundated to approximately one foot for approximately seven days following recent storm events and water holding activities behind the Dam. The installation of plants in the DG-W-2 mitigation area appears to have been completed successfully and the issues noted during the monitoring are not expected to have an impact on the continued growth of the plants. Photos 7 through 10 in Attachment B document the mitigation area during the monitoring visit.

During the monitoring visit, it was noted that many of the existing mature black willow (*Salix gooddingii*) in this mitigation area that were showing signs of beetle infestation during previous monitoring visits were impacted by the last storm event and additional trees were noted as having fallen over or experienced branch failure. Signs of infestation noted during previous monitoring visits included entry/exit holes, frass, galleries, fungal residue, and branch failure. Further investigation into this issue is being conducted with the help from the Los Angeles County Department of Agricultural Commissioner/Weights & Measures (ACWM) and preliminary surveys mostly showed only low to moderate infestation in these areas. It should be noted that evidence of infestation was only noted on existing mature willows and not on any of the recently installed container plants. It should also be noted that many of the existing willows showing dieback were beginning to sprout from the base.

Native plant growth was noted throughout the DG-W-2 mitigation area, and what was present is likely from both natural recruitment and from seeding. Native plants such as mugwort, mulefat, salt heliotrope (*Heliotropium curassavicum*), and Douglas' nightshade (*Solanum douglasii*) were observed sprouting in the DG-W-2 mitigation area. It was noted that the dodder observed growing on some of the young container plants during previous monitoring visits had been removed. Native cover was estimated to be approximately 35 to 40 percent in the DG-W-2 mitigation area.

Nonnative weed cover in DG-W-2 was estimated at approximately 15 to 20 percent, which is approximately ten to fifteen percent more than the level of nonnative cover that was observed during the last monitoring event. Nonnative species observed in DG-W-2 included black mustard, poison hemlock, red-stemmed filaree, and perennial pepperweed. Most of the nonnative weeds observed in this mitigation area were vegetative and just starting to germinate and are likely proliferating following recent rains.

2.3.4 DG-W-2 Outlet

The overall health of the container plants in mitigation area DG-W-2 was noted as being good. Approximately five percent of the container plants were noted as showing varied levels of stress and a negligible number were noted as being dead or missing. This is approximately the same percentage of plants that were showing stress during the last monitoring event. Stress may be occurring due to similar reasons described for DG-W-1. Formal mortality counts were taken for DG-W-2 Outlet during the 2021 quantitative monitoring and were included in the 2021 annual reporting. Some of the container plants were noted as lacking well defined basins and should have their basins properly constructed and/or repaired. In addition, mature willows in this area were noted as having branch failure, likely due to recent high winds. The irrigation line appeared to be functioning properly during the monitoring visit. Evidence of flow during the last storm event, including sediment deposits and heavily saturated soils in the lower part of the channel were observed during the monitoring event. In addition, some of the woodchips from stockpiles belonging to the City of Pasadena that were observed to have flowed down stream and been deposited into DG-W-2 Outlet during the previous monitoring event were observed to still be present and should be removed. The installation of plants in the DG-W-2 Outlet mitigation area appears to have been completed successfully and the issues noted during the monitoring are not expected to have an impact on the continued growth of the plants. Photos 11 through 14 in Attachment B document the mitigation area during the monitoring visit.

Native plant growth was noted throughout the DG-W-2 Outlet mitigation area, and what was present is likely from both natural recruitment and from seeding. Native plants such as mugwort, mulefat, tall flatsedge (*Cyperus eragrostis*), salt heliotrope, evening primrose (*Oenothera elata*), and Parry's phacelia (*Phacelia parryi*), were observed sprouting in the DG-W-2 Outlet mitigation area. Dodder that was previously noted on container plants appears to have been removed during recent maintenance activities. Native cover was estimated to be approximately 30 to 35 percent in the DG-W-2 Outlet mitigation area.

Nonnative weed cover in DG-W-2 Outlet was estimated to be approximately ten percent which is approximately the same as the percentage of weed cover that was observed during the previous monitoring visit. Nonnative species observed in DG-W-2 included black mustard, poison hemlock, and perennial pepperweed. Most of the nonnative weeds in this mitigation area were just starting to germinate and were not going to flower or seed.

2.3.5 DG-4 Sheet Flow/DG-SF-1

The overall health of the container plants in mitigation areas DG-4 Sheet Flow (northern) and DG-SF-1 was noted as being good. Approximately five percent of container plants were showing varied levels of stress which is approximately the same percentage of container plants that were showing stress during the previous monitoring event. Stress may be occurring due to similar reasons described for DG-W-1. Formal mortality counts were taken during the 2021 quantitative monitoring and were included in the 2021 annual reporting. Some of the container plants were noted as lacking well defined basins and should have their basins properly constructed and/or repaired. In addition, minor herbivory of young plants was observed within the DG-4 Sheet Flow and DG-SF-1 areas and should continue to be monitored. The irrigation line appeared to be functioning properly during the monitoring visit. The installation of plants in

the DG-4 Sheet Flow and DG-SF-1 mitigation areas appears to have been completed successfully and the issues noted during the monitoring are not expected to have an impact on the continued growth of the plants. Photo 15 in Attachment B documents the mitigation area during the monitoring visit.

Minimal native plant growth was noted throughout the DG-4 Sheet Flow and DG-SF-1 mitigation area, and what was present is likely from both natural recruitment and from seeding. Native plants such as mugwort, mulefat, and tall flatsedge, were observed sprouting in the DG-4 Sheet Flow and DG-SF-1 mitigation areas. Native cover was estimated to be approximately 35 to 40 percent in the DG-4 Sheet Flow/DG-SF-1 mitigation area.

Nonnative weed cover in DG-4 Sheet Flow and DG-SF-1 was estimated at approximately 20 to 25 percent which is approximately 15 to 20 percent more than the level that was observed during the previous monitoring visit. Nonnative species observed in DG-4 Sheet Flow and DG-SF-1 included black mustard, poison hemlock, and perennial pepperweed. Most of the nonnative weeds in this area were just starting to germinate and were not going to flower or seed.

3.0 RECOMMENDATIONS

3.1 Nonnative Plant Control

Nonnative weed cover was found to be less than five percent to twenty-five percent for the Phase 2 mitigation areas. In addition, evidence of recent weed abatement activities was present in the Phase 2 mitigation areas. Because weed abatement had recently occurred in most of the mitigation areas, weed growth was just beginning to germinate and most weeds were not going to flower or seed. Regular maintenance and removal of nonnative weeds is of the highest priority for all of the mitigation areas to reduce competition between native and nonnative plants. In addition, eucalyptus stumps that are starting to re-sprout should be trimmed back frequently. A focus should be placed on removing the weeds and nonnatives from the basins of each of the container plants and cuttings; however, nonnative weeds just outside of the planting areas can migrate into the planting areas via seed dispersal. Outside of the nesting bird season, a focus should also be made to remove nonnative weeds in areas where least Bell's vireos are likely to nest during the breeding season (i.e. in the vicinity of the least Bell's vireo nest that was active in 2020). Nonnative plants and weeds that have gone to seed should be bagged and removed from the mitigation area. Without the use of herbicides, control of the nonnatives will be extremely difficult so the frequency and level of effort will need to be increased to provide control until the native plants and seedlings have a chance to grow and outcompete the nonnatives. In particular, it is important to maintain long-term perennial pepperweed management to reduce competition and allow for native plants to germinate. In addition, dodder should be removed from container plants in the mitigation areas. Although many species of dodder are native, this parasitic plant can be harmful to younger shrubs and trees that are not yet established and can even cause mortality.

3.2 Irrigation

The irrigation system was inspected for functionality and appeared to be properly installed. Irrigation was actively occurring during the monitoring visit and the soil for most container plants was found to be moist

at and below the surface. Some of the emitters were observed to be outside of the container plant basins, likely due to erosion, water flow, and/or public interference. Twice weekly watering events should be conducted for the container plants unless adequate rainfall occurs. After watering, the container plant basins should have at least 0.5 inch of saturation depth. Continual maintenance of the irrigation system should be conducted to ensure all plants are evenly watered and the tube emitters are placed at the base of the container plants. Watering of the seeded only areas is not recommended.

3.3 Herbivory

Rabbit herbivory of container plants was observed in the Phase 2 mitigation areas. California rose (*Rosa californica*) appeared to be the most affected by herbivory. Minor herbivory generally will not kill the plants, but continued monitoring should be conducted during future visits to determine the level of the herbivory isn't such that plants are dying. As the plants become more established, they will be less susceptible to the effects of herbivory. It should be noted that the cages installed by Nature's Image around container plants following container plant installation have been removed for container plants that have outgrown the cages and no longer require protection; however, if browsing by rabbits or other animals begins to worsen, additional caging around affected and/or favored container plants may be warranted.

3.4 Erosion

Erosional issues that were observed within the Phase 2 mitigation areas during the previous monitoring visit that were likely caused by the December 14, 2021 storm event were observed to have worsened following additional storm events at the end of December 2021. Significant erosion issues were generally not observed within the Phase 2 mitigation areas. However, until more native perennial plants become established in these areas, there is the potential that intense rainfall may create erosion problems. In addition, significant erosion was observed for some of the Phase 3 areas, especially the Side Slopes. During future monitoring events, erosion should continue to be monitored in all planted areas and if warranted, erosion Best Management Practices (BMPs) should be installed in appropriate areas. This may only require the installation of straw wattles at select sites to prevent existing rills from becoming larger.

If you have any questions about the information presented in this letter, please contact me at CLancaster@ecorpconsulting.com or (714) 648-0630.

Sincerely,



Carley Lancaster
Staff Biologist

ATTACHMENT A

Field Notes

ATTACHMENT B

Photo Documentation